Science Education

Formerly GENERAL SCIENCE QUARTERLY

The Official Journal of the National Association for Research in Science Teaching, the National Council of Supervisors of Elementary Science, and the Science Association of the Middle States

Volume 19 FEBRUARY, 1935 Number 1

» » Contents « «

PUBLISHED BY

SCIENCE EDUCATION, INCORPORATED

The subscription price is $2.00 a year; $2.50 in Canada and other foreign countries. Single copies are 60 cents; 75 cents in foreign countries.

Prices on back numbers will be sent on request.

Prices on reprints of articles are available to authors.

For "Suggestions to Authors" concerning form of articles see the October and December, 1931, issues or write to the Editor.

Science Education

Devoted to the Teaching of Science in Elementary Schools, Junior and Senior High Schools, Colleges and Teacher Training Institutions

Volume 19 FEBRUARY, 1935 Number 1

THE SELECTION OF SCIENCE PRINCIPLES SUITABLE AS GOALS OF INSTRUCTION IN THE ELEMENTARY SCHOOL

MARTIN L. ROBERTSON

Colorado State Teachers College, Greeley, Colorado

THE PROBLEM

The purpose of this investigation is to determine the principles of science suitable as goals of instruction in the elementary grades. This investigation is not concerned directly with the grade placement of principles, the order of presentation of principles, nor with the topics and activities involving these principles.

The term *Elementary Grades* as used in this study refers to the first six grades of the usual school organization or to comparable age or development levels in schools with other types of organization.

The term *Principle* as used in this study refers to a major generalization of science that conforms to the following criteria:*

Criteria for a principle

a. To be a principle, a statement must be a comprehensive generalization.
b. It must be true without exception within limitations specifically stated.
c. It must be a clear statement of a process or an interaction.
d. It must be capable of illustration so as to gain conviction.
e. It must not be a part of a larger principle.
f. It must not be a definition.
g. It must not deal with a specific substance or variety or with a limited group of substances or species.

It is assumed that the principles of science are the same at any school level.

THE METHOD

A number of studies purporting to select the principles of science that occur or are implied in magazines, in the textbooks in general science, and the specialized sciences were available. Assuming that these studies are appropriate sources of principles, the writer arbitrarily established the follow-

* These criteria were established by a group of science teachers after many weeks of careful consideration. These teachers met with Dr. F. D. Curtis in a seminar in science teaching. The criteria were modified to their present form after conferences with the writer's committee, and with subject-matter specialists of the University.

ing criteria for the selection of contributory investigation:

Criteria governing the selection of reports of analyses

a. The study must have been undertaken with the purpose of selecting scientific principles.
b. The available report must contain a more or less detailed list of the scientific principles determined from the investigation.
c. The report should indicate the rank order of the frequency of appearance or in some manner point out the stress given in the analyzed materials to each of the principles included.

The following available sources were found to meet the criteria:

a. Fred Moore, *Determination of the Principles of Chemistry.* Master's Thesis (unpublished), University of Michigan, 1931, Pp. ii–72.
b. Earl Debus, *Determination of the Principles of Chemistry.* Master's Thesis (unpublished), University of Michigan, 1931.
c. Adrin Kay, *Determination of the Scientific Principles as Found in Six Widely Used Physics Texts.* Master's Thesis (unpublished), University of Michigan, 1932, Pp. v–97.
d. E. R. Downing, "Technique for Determination of Basic Principles in Science Courses," *Science Education* 14: 298–303; November, 1929.
e. E. R. Downing *et al., A Program for Teaching Science,* Chapter XIV, Thirty-First *Yearbook* of the National Society for the Study of Education. Bloomington: Public School Publishing Company, 1932.
f. E. R. Downing, "An Analysis of Textbooks in General Science," *General Science Quarterly* 12: 509–516; May, 1928.
g. Oliver Blair Wilbur, *A Study of the Principles of Science Contained in General Science Textbooks Published Since the Year 1924.* Master's Thesis (unpublished), University of Michigan, 1931, Pp. iv–130.
h. Jessie A. Menzies, *An Analysis of the Generalizations and Applications in Ten College Text-Books in Biology.* Master's Thesis (unpublished), University of Chicago, 1927.
i. R. C. Karpinski, *Principles in Five College Text-Books in Geology.* (Unpublished study.) University of Michigan, 1933.
j. John T. Sites, *Chemical Principles, Concepts, and Technical Terms Used in Science Magazines.* Master's Thesis (unpublished), University of Chicago, 1930.

These combined sources involved careful analysis of more than seventy-five textbooks and revealed hundreds of principles appropriate to the various criteria of the several investigators.

Selection of the Principles. Lists of principles and partial principles were secured from the sources. A difficulty encountered was that of eliminating those statements which conformed to most but not to all of the criteria used in this study. Not wishing to accept the total responsibility for such important decisions, the writer solicited three science teachers to serve as a jury.* This jury held five meetings of several hours each. Each statement was compared with the criteria, discussed, and either accepted or rejected. For example, the statement, "Matter and energy may be transformed but they cannot be created or destroyed," was deemed by the jury to satisfy all the criteria. The statement, "Work equals force times the distance through which the force moves," was considered to be a definition of work and was rejected on that basis. The statement, "Machines are used to increase the magnitude of a force, to increase speed, or to change the direction in which a force is applied," was not considered to be a comprehensive generalization, since the statement is not true without exception and since, also, it does not involve a process or interaction. Therefore it was rejected. The statement, "The sun transmits both heat and light to the earth without heating and lighting the intervening space, because there is no matter in it to be heated or lighted," was considered to be a part of the principle, "Radiant energy travels through space in all directions undiminished," and was therefore rejected.

In some cases, the statement was modified

* Dr. F. D. Curtis, Mr. W. C. Darling, and Mrs. Paul Sherman. These three teachers are members of the science department of the University High School, University of Michigan.

in such a way that it conformed to all of the criteria. Thus the statement, "In the digestive system, foods are reduced to liquids, subjected to the action of enzymes, passed through the cell walls of the intestines, and absorbed by the blood," was modified to read as follows: "Protoplasm may be nourished only when food substances are reduced to liquid form by enzymes and absorbed by the cells."

Certain principles were so inclusive that the jury deemed it practical to retain some of the minor principles that contributed to them. For example, the statement, "Light rays nearly always may be brought nearer together, converged or focused by convex lenses and diverged by concave lenses," was classified as a subsidiary principle under the statement, "When waves pass obliquely from a rare to a denser medium, they are bent or refracted towards the normal; when they pass from a dense to a rarer medium, they are bent away from the normal."

Wilbur's list was considered first. As each subsequent list was read, additional statements were revealed and subjected to the treatment described above. In every case, those statements that conformed to all of the criteria were added to the nucleus furnished by Wilbur's list.

Whenever the jury disagreed with respect to a statement, the latter was preserved with the accepted list.

In order to remove these questionable statements and to refine the list as a whole, the writer secured the cooperation of several subject-matter specialists* who spent from one to ten hours each in discussing whether these statements as written fitted the criteria. In those cases where it was the opinion of the expert that a statement was not true, the statement was thrown out entirely, limitations were added to make it true as stated, or the principle which the statement suggested but did not state was written with the approval of the subject-matter specialist. A number of additional principles conforming to the criteria and pertinent to the various fields of science were secured in this manner.

Two hundred forty-three principles and subsidiary principles was selected by both the jury and the science specialists. These principles are not listed here for lack of space.

It is not the writer's contention that this list of principles includes all the important generalizations of science. Nor does he imply that other juries of specialists would necessarily agree with the selection, statement, or importance of all these principles. However, the author believes it to be a more comprehensive, and extensive study of principles of science than any that have heretofore been made available. Moreover, it is defensible in every part in accordance with the technique followed and the criteria used.

Several of the lists used as sources for this study had been prepared with the cooperation of science experts in various colleges and universities. It is only fair to these scientists to point out that the lists were presented to them by graduate students for ranking as *stated*. They were not given the privilege of making necessary or desired changes and as a consequence a number of incorrect statements appear in several lists through no fault of the scientists. Another unfortunate outcome of the technique employed by the earlier investigators was the exclusion of a number of principles from the lists because they were not universally true as stated and no provision was made for changing them. Both these weaknesses have been corrected in the technique used in this study.

* The professors in the University of Michigan who so willingly gave of their time are: Dr. George L. LaRue, Professor of Zoology; Dr. Roy K. McAlpine, Professor of Chemistry; Dr. Franklin Shull, Professor of Zoology; Dr. Floyd Bartell, Professor of Physical Chemistry; Dr. E. D. Barker, Professor of Physics. The writer also conferred with Dr. Robert Karpinski, a Geologist, on the principles pertaining to geology.

DETERMINATION OF THE SUITABILITY OF THESE PRINCIPLES FOR INSTRUCTION IN THE ELEMENTARY SCHOOL

There are several available approaches to the determination of suitability.

1. The opinion of science experts as to the principles most suitable for the elementary school could be used.
2. Laymen could indicate their need for a functional understanding of the principles.
3. The child's environment could be analyzed to reveal the needs of those principles in comprehending it.
4. The opinions of experts experienced in the teaching of elementary science could be combined and principles selected on the basis of their composite judgment.

All of these approaches have been given consideration in this study. But it was thought that the opinions of these actively engaged in the teaching of elementary science would be the most useful primary criteria of the suitability of the various principles to serve as ultimate goals of instruction in the elementary grades. The criteria set up for the selection of a number of such experts to serve as raters of these principles follows:

Criteria for the selection of raters

1. Those people who were actively engaged in teaching science in the elementary grades, superivising the teachers of science in those grades, or teaching teachers how to teach science in the elementary grades, were considered eligible and desirable as cooperators in the selection of the principles.
2. Consideration was also given to the length of experience and to the publications of the available teachers.

Upon the basis of these criteria twenty supervisors and professors of the teaching of elementary science were selected and their aid solicited.

(*To be concluded in the April issue.*)

PREDICTING SUCCESS IN COLLEGE PHYSICAL SCIENCES

Mazie Earle Wagner and Eunice Strabel
The University of Buffalo

The physical sciences are studied in college not only by those who wish to teach or do research in these subjects, but in even larger numbers, students take courses in chemistry, biology, physics, geology and the like as pre-professional training in medicine, dentistry, and engineering. Vocational and educational guides in high school as well as personnel officers and registrars in colleges ought to know, so far as possible, the relation of such measures as are available to success in the general sciences. It is, therefore, of profound importance that data be available indicating, prior to college entrance, the likelihood of success and failure in this major field of knowledge.

The present investigation is part of a larger study of prediction.[1] Our experimental group includes students who entered The University of Buffalo during the years 1925–1929 (661 men and women). Transfers from or to other colleges as well as those who "failed out" during the first semester were excluded from our study. The following items of information were gathered:

The high school Regents average: a weighted average of all "academic" New York State high-school-Regents grades reported by the high school to the college. Grades in music, drawing, shop, home-making, and commercial subjects were excluded from this average, not being considered "academic." Each Regents grade was weighted according to the amount of unit credit which it represented.

Individual college physical science grades and the freshman-sophomore college physical science average were secured.

All high school individual subject Regents grades were obtained, and in addi-

tion the school marks for determining the predictive value of place in high school graduating class. The exact position in the class was determined for all students from four of the large high schools of Buffalo, this measure being contrasted with the Regents average, as above.

The scores and sub-test grades for the *American Council Psychological Examination for High School Graduates and College Freshmen*[2] were secured in the form of sigma or standard scores.[3]

The *Iowa High-School Content Examination*[4] had been administered to four of the five entering classes under consideration. Sigma scores for the total Iowa Content Examination and for the four sub-tests, English, Mathematics, Social Science, and Physical Science, were also obtained for each student.

In addition, sex, age at high school graduation, and number of high school units credit were included in our data.

Table I shows prediction correlation coefficients for the average performance in all general science subjects carried during the first two years of college attendance. It

TABLE I
ZERO-ORDER CORRELATION COEFFICIENTS BETWEEN AVERAGE PHYSICAL SCIENCE IN COLLEGE AND VARIOUS MEASURES
(Correlations listed according to size)

	Boys		*Girls*		*Total*	
	No.	*r*	*No.*	*r*	*No.*	*r*
Regents Latin III	216	.51	154	.47	370	.74
Total Regents Ave.*	223	.43	149	.63	372	.59
Rank in H. S. Grad. Class*	236	.48	155	.55	391	.50
Total Regents Ave.	388	.44	214	.54	602	.46
Regents Amer. Hist.	350	.39	206	.57	556	.46
Regents Chemistry	128	.43	45	.34	173	.41
Iowa Content Total	338	.35	139	.41	477	.37
Regent Physics	228	.38	70	.34	298	.36
Regents Biology	326	.24	195	.52	521	.35
Iowa Content English	343	.30	139	.29	482	.31
Iowa Content Science	341	.33	139	.17	480	.24
A. C. E. Total	414	.18	227	.25	641	.22
A. C. E. Opposites	420	.24	227	.18	647	.22
A. C. E. Completion	420	.17	227	.31	647	.20
A. C. E. Analogies	356	.19	144	.16	500	.18
Age at H. S. Grad.	376	−.15	211	−.17	587	−.17
Iowa Content Math.	341	.17	139	.15	480	.16
No. H. S. Units	428	.15	228	.16	656	.15
A. C. E. Arithmetic	420	.11	227	.25	647	.14
A. C. E. Art Lang.	420	.07	227	.11	647	.09

* For students from four large urban high schools.

will be noted that Regents Latin III (Cicero) correlates with average college physical science to the degree indicated by r .74 for the total group of students having had some physical science during the first two years of their college attendance. Of those measures investigated, Regents Latin III is outstandingly the most predictive. The next highest relationships between our criterion, average physical science

college grades, and other measures are for the girls: total Regents average (r .54), Regents American history (r .57), and Regents biology (r .52). Regents Latin III correlates r .51 with our criterion for the boys. Except for rank in high-school-graduating class, all other *r's* are less than .50, the majority being less than r .40.

Rank in graduating class, for students from four large high schools, is related to average physical science to the degree expressed by r .50, as contrasted with r .59 for the same students between our criterion and total Regents average.

The low *r's* between the average grade in college science with grades in high-school science and mathematics as well as with

Our second criterion of general ability in physical science is success in an orientation course in this field given to freshmen during the first semester of their college attendance. Latin III Regents (See Table II) is the best indicator of success in this course, just as it indicated average success in general science. Regents American history stands second and is particularly good in predicting the science performance of girls; the total Regents average is third. This last measure is particularly good in estimating the success of boys. The total Iowa Content Examination is fourth high in its relation to our physical science orientation course—the actual coefficient for the total group is r .42 and for the girls r .55.

Table II
Zero-Order Correlation Coefficients Between the General Science Orientation Course and Various Measures
(Correlations are listed according to size)

	Boys		*Girls*		*Total*	
	No.	*r*	*No.*	*r*	*No.*	*r*
H. S. Latin III	139	.46	139	.51	278	.50
H. S. American Hist.	218	.37	188	.57	406	.47
H. S. Ave	216	.54	193	.32	409	.45
Total Iowa Content	181	.37	122	.55	303	.42
H. S. Biology	200	.25	179	.44	379	.37
Total A. C. E.	229	.24	208	.31	437	.28
Iowa Content Science	178	.28	122	.34	300	.22
Iowa Content Math.	180	.16	122	.24	302	.15
A. C. E. Arithmetic	234	.18	208	.09	442	.15

test scores in mathematics and science brought some surprise. Without investigating, one would not have guessed that Latin III and American history Regents would predict college science performance better than science and mathematics measures. Having such data at hand, however, one may deduce that the sciences in college require the type of determination, motivation, persistence, and memory ability required in a study of Latin; also that the ability to read and retain facts, valuable in success in high school American history, is also needed in college science.

The only other *r* above .40 is that with Regents biology for girls. The American Council Psychological Examination is definitely less related to college performance in this course at this University, as well as to average work in general science, than all measures discussed above.

Physics

Three measures, of those investigated, are related to introductory college physics to the extent expressed by r .50 (See Table III). These are Regents trigonometry, chemistry, and physics. It is unfortu-

nate that only slightly over one-half of those who take introductory college physics have had either of these courses in high school. Of the remaining measures investigated, the total Regents average is the best predictor, but the *r* for the total group of boys and girls is only .40, for the boys r .42, for the girls r .48. The Content Examination is next high in closeness of relationship; the Psychological Examination being considerably lower.

TABLE III
ZERO-ORDER CORRELATION COEFFICIENTS BETWEEN INTRODUCTORY COLLEGE PHYSICS AND VARIOUS MEASURES
(Correlations are listed according to size)

	Boys		*Girls*		*Total*	
	No.	*r*	*No.*	*r*	*No.*	*r*
Regents Trigonometry	50	.48	9		59	.58
Regents Chemistry	87	.55	10		97	.57
Regents Physics	109	.54	14	.62	123	.55
Total Regents Ave.	153	.42	30	.48	183	.40
Iowa Content Science	145	.41	20	.07	165	.38
Iowa Content Total	146	.38	20	.30	166	.37
Regents Int. Algebra	178	.37	32	.24	210	.34
Regents Latin III	99	.34	23	.20	122	.30
Regents Amer. Hist	158	.23	30	.49	188	.28
Iowa Content Math.	146	.31	20	.08	166	.24
A. C. E. Total	176	.19	32	.03	208	.17
A. C. E. Arithmetic	180	.06	32	.22	212	.08

Chemistry

The policy of the Chemistry Department at this University has changed within the past few years, so that data as collected for subjects of the five-year group are not applicable at this time. However, a few comparisons are of interest.

Regents chemistry has been related to introductory college chemistry prior and since the change of policy. The magnitude of the relationships are surprisingly similar. For the earlier group, the relationship between Regents chemistry and the two semesters of introductory college chemistry was r .47 PE .06. For the more recent classes, Regents chemistry and the first semester of introductory chemistry correlate as indicated by r .46 PE .05. Among the measures investigated for the earlier group, the Regents chemistry grade was the most closely related to college chemistry. Only about one-third to one-half the freshman college chemistry class had had the subject in high school, which makes us fall back on *r's* of less than .40 for the prediction of success of the remaining students. For fifty-six students taking chemistry since the change of policy in that department, and having had both physics and chemistry in high school, the relationship between the average Regents mark for these two subjects and the first semester of introductory chemistry was r .64. Such a predictive measure covers only a minority of the members of the introductory college chemistry class, and leaves predictors at a loss for the remaining students. The relationship r .64, however, is suggestive for those coming from high school with a science sequence.

Fifty of the 1931–32 entering freshman class completed the introductory course in chemistry at this University. All of these had had chemistry in high school and had taken the Columbia Research Bureau Chemistry Test[5] prior to their taking the course.

The relationship between the test results and grades for the year's course was r .63 PE .06. There is a possibility that this relationship might have been higher if it had not been for the fact that those making the highest test scores were placed in a special section in which the amount of work was greater and the pace more rapid. The relationship between the grades in the first semester of this course and the Columbia Research Bureau Chemistry Test was r .32 for the fifty-five cases for whom this material is available. The relationship between the total course grades and the chemistry test is of the same magnitude as that between course grades and average Regents chemistry and physics marks, but definitely superior to any other single measure. This test, because of its content, can be administered only to those who have had secondary-school chemistry; and is, therefore, limited in its predictive value.

Biology

For the variety of introductory biology courses offered, there is a scattering of correlation coefficients of the magnitude of r .40 or more and an occasional one of r .50. For the year course in botany, the best relationship was with Regents average, r .41 for the total group. However, for a semester course in this subject, a more popular course, a relationship of r .51 was obtained. Latin III Regents was next high (r .41). The sub-test science of the Iowa Content Examination was related to this semester course to the magnitude of r .34.

The year course in zoology is related more highly (r .61 for 91 boys and r .55 for the total class of 99) to the Iowa Content sub-test Science. When this zoology course in condensed to a semester course, the highest relationship for the total group is r .35 with the Regents biology score. For the 47 girls who had taken the semester course, Regents biology produced r. 51 with our criterion.

With the sophomore course in comparative anatomy, no relationship was obtained of a degree as high as r .30. That is, no correlation coefficient was high enough to indicate a relation sufficient to allow the prediction of individual success with even a small amount of accuracy.

Geology

The best relationship between geology and any measure studied is that with the total Regents average, the relationship being r .49 for the total group of 126 students who had taken the course during their freshman or sophomore year. Total Iowa Content scores correlated with geology grades for the thirty-one girls to the extent indicated by r .55; for the same group, the Regents average correlated r .57. The majority of students who take this course in college, however, are boys, for whom the highest *r is* .39 (between Regents average and geology). High-school science courses are but very slightly related to this field.

Summary and Conclusions

1. For both the general average in the field of the physical sciences and for the general orientation course, Regents Latin III is the best predictor. Also, rather surprisingly, Regents American history for the girls stands high in its predictive value.

2. Except for those students who have had either Regents chemistry, physics, or trigonometry, it is impossible to predict individual performance in college physics with much accuracy. For group prediction, the Regents average may be used with some success.

3. Except for those students who have had chemistry or physics in high school, it is impossible to predict individual success in college chemistry. The combination of physics and chemistry Regents marks predict college performance in chemistry as well as does the Columbia Research Bureau Chemistry Test.

4. The Regents average surpasses other measures studied in the prediction of college botany; while the Iowa Content subtest Science is first in a list of *r's* with college zoology.

5. The Regents average is also the best predictive device for college geology. However, this relationship is not very high.

REFERENCES CITED

[1] Wagner, Mazie Earle. "Prediction of College Performance." *The University of Buffalo Studies* 9: 125–172, 184–207. (This study was made possible through a grant from the General Education Board).

[2] Thurstone, L. L., and Thelma Gwinn. *Psychological Examination for High School Graduates and College Freshmen.* Washington, D. C.: American Council on Education.

[3] Hull, C. L. "The Computation of Pearson's *r* from Ranked Data." *Journal of Applied Psychology* 6: 385–390, 1922.

[4] Ruch, G. M., Stoddard, G. D., *et al. Iowa High School Content Examination.* Iowa City, Iowa; Bureau of Educational Research and Service, University of Iowa.

[5] Jette, E. R., Power, S. R., and Wood, Ben D. *Columbia Research Bureau Chemistry Test.* Yonkers, N. Y.: World Book Company.

THE DISCOVERY OF BETTER TEACHING TECHNIQUES FOR GENERAL SCIENCE

TRUMAN D. FOX

Instructor in the J. Sterling Morton High School, Cicero, Illinois

This article is based on the results of a study recently completed by the writer,[1] in which a comparison was made between old and new techniques of teaching. This study was carried on for the purpose of determining pupil errors in a general science course, analyzing the common errors, and formulating modified techniques of teaching to reduce the errors. An attempt was made to study the causes of these common pupil errors and to base the modified techniques of teaching directly upon those conditions which could be rectified, either by the teacher or by the pupil.

Standardized tests were given for five separate units in a course in general science. Pupil errors on these tests were summarized. Further evidence was collected through the examination of the pupils' written work. An attempt was made to make the evidence as objective as was possible.

In the school where this study was made, the students were grouped according to their intelligence. Therefore, it was possible to use two separate groups for study purposes. One group represented the upper quartile in intelligence, while the other group represented the lower quartile in intelligence. The higher ranking group was designated Group I, while the lower ranking group was called Group II. Each of these groups was composed of thirty boys, who were taking general science as a required course. No attempt was made to alter the personnel of the groups used in this study, or to change the techniques of teaching from that which had been used previously by the writer.

Upon the completion of each of these typical units of general science, the test was given and the results were summarized. There were certain pupil errors which predominated. These errors were continually interfering with the pupils' mastery of the subject matter. The number and kinds of errors suggested the advisability of trying to correct the causes of them. A partial list of these pupil errors discovered might be classified as follows:

1. Lack of knowledge of principles or major ideas of general science.
2. Lack of observation in scientific procedure.
3. Inability to read graphs, tabulations, and figures.
4. Inability to make applications in a scientific manner.
5. Failure to analyze scientifically, draw conclusions, and see relationships.
6. Failure to comprehend new words in science.
7. Limited experience of pupils in the field of science.

This list of the causes of pupil errors made it possible to attempt improved teaching

techniques which would eliminate the errors that were so much in evidence. To insure a thorough study, only three of these causes of pupil errors were selected as a basis for modified techniques of teaching. These new teaching techniques were given the following titles:

1. The demonstration technique.
2. Techniques of stressing major ideas.
3. Technique of teaching vocabulary.

Much of the learning in general science is dependent upon the demonstration presented to the pupils. The early recognition of the possibilities of increasing a pupil's skill in learning through the use of good demonstration is essential for successful teaching. In this study, to insure proper observational learning through the use of demonstration, the following factors were emphasized in the teaching procedure:

1. Quiz pupils to insure an understanding of the purpose of the demonstration.
2. Suggest the sort of things that pupils can observe. Give them drill in picking out the essential things.
3. Maintain as favorable conditions as possible for good observation. Make it voluntary and spontaneous.
4. Stimulate pupils to be accurate and thorough.
5. Give drill in arranging data in logical sequence and in drawing correct conclusions.

The second new teaching technique involved the stressing of major ideas as they had been discovered in the textbook. The study of the test material gave much evidence that one cause of pupil errors was the failure of pupils to recognize and analyze carefully the major ideas and problems, as they arose in their daily work. In other words, the pupils showed a lack of skill in organizing their study material in a logical, concise and meaningful manner. Therefore, an attempt was made to set up a different teaching technique whereby the pupils would be taught a proper method of analyzing and organizing the material which involved the major ideas and problems of each unit being studied. To accomplish the aims of this new technique the following steps were taken:

1. Teaching the pupils to search for and find the various major ideas of each problem found in reading the textbook material for each of the units.
   a. By reading first, the general idea of the unit.
   b. Selecting central idea in each paragraph.
   c. Listing subordinate ideas of each paragraph under the central idea.
   d. Teaching pupils how to make an effective outline of above material.
2. Motivation devices.
   a. Comparing good and bad analysis as discovered in pupil papers.
   b. Biographies of great scientists emphasizing their methods of scientific thinking.
   c. Demonstrations as a means of analyzing problems and drawing conclusions.

The final new teaching technique was built around the development of the pupil's science vocabulary. This technique was based in the theory that an understanding of the new words discovered was necessary to insure mastery of the subject matter. Furthermore, these new words must become a part of the pupil's vocabulary. A basic vocabulary of common science words was given to each pupil, who selected the unfamiliar words and made a special study of them. New words were added to this basic science vocabulary from time to time, as they were discovered in the study of the various units. A test was constructed which was based on this list of words, and then given to the pupils. A check of the results of this test suggested the use of remedial teaching to insure a more thorough mastery of the science vocabulary. The following devices were used:

1. Have pupil list their own science vocabu-

lary, as discovered in the study of each unit.

2. Use of personal experience in building up understanding of new words.
3. Use of demonstrations in bringing out meaning of new words.
4. Emphasizing importance of an adequate vocabulary as a means of clear thinking.
5. Encouraging use of dictionary and building up lists of synonyms.

To determine the effectiveness of the revised techniques, two groups of students were selected that were comparable to Group I and Group II in ability and achievement. Great care was exercised in selecting fully comparable groups. These two new groups were called Group IA and Group IIA. Then, these new teaching techniques were used in teaching the same units to the two new Groups. Upon the completion of each of these units, the students of Group IA and Group IIA were tested in the same manner as Group I and Group II. The test results were studied and analyzed to determine if there had been any improvement through the use of the new techniques. The new teaching techniques described previously were the only variations in the methods used between the original groups and Group IA and Group IIA. Therefore, any improvement shown should be the result of using the revised teaching techniques.

Since the standardized test used for testing each unit had established norms, it was possible to state in numerical values any improvement shown in the results of the new techniques. In order to show these quantitative results, Table I was constructed. This table is self-explanatory.

Table I shows that the use of the three new teaching techniques brought about a great deal of improvement on the part of the students in mastering the five units prescribed in this study. Group IA showed an improvement of 33.2 per cent over that of Group I, while in Group IIA the improvement was 30.5 per cent over Group II. Furthermore, Table I gives the evidence of the remarkable improvement by the students of the lower intelligence group. It is also apparent that the decrease in pupil errors is greater in some units than in others.

It is to be noted that the high intelligence group profits more by the improved techniques of teaching than the low intelligence group. But note also that the latter group makes a slightly better total score (120.9) when given the advantage of the improved techniques than the score (120.8) achieved by the high intelligence group without them. The improved techniques appeared to be

TABLE I

SUMMARY TABLE OF IMPROVEMENT SHOWN BY GROUP IA AND IIA OVER GROUP I AND II, AFTER THE USE OF REVISED TECHNIQUES

	Q_1					M_d					Q_3					Totals
Units	9	10	11	12	13	9	10	11	12	13	9	10	11	12	13	
Norms ...	8.9	13.0	7.1	9.7	9.6	7.0	10.6	5.2	7.3	7.1	5.5	8.2	3.4	5.2	4.8	114.6
Group I ...	9.5	11.8	8.1	11.5	11.2	7.5	9.0	6.0	8.7	9.0	5.5	6.0	3.5	6.5	7.0	120.8
Group IA .	12.0	15.7	10.9	12.5	13.0	10.0	14.5	8.9	9.8	9.5	8.3	12.5	6.8	8.5	8.2	161.1
Diff.	+2.5	+3.9	+2.8	+1.0	+1.8	+2.5	+5.5	+2.9	+1.1	+0.5	+2.8	+6.5	+3.3	+2.0	+1.2	40.3
Group II ..	9.2	10.0	5.0	9.0	9.2	7.0	7.0	4.0	6.0	6.2	5.6	4.8	2.0	3.8	3.8	92.6
Group IIA	10.2	12.8	8.2	10.9	10.5	7.2	10.5	6.9	9.0	6.1	6.0	8.0	4.6	6.0	4.0	120.9
Diff.	+1.0	+2.8	+3.2	+1.9	+1.3	+0.2	+3.5	+2.9	+3.0	−0.1	+0.4	+3.2	+2.6	+2.2	+0.2	28.3
Total Diff.	Group IA 12.0					12.5					15.8					40.3
Total Diff.	Group IIA 10.2					9.5					8.6					28.3
Total Improvement of Group IA .... 33.2 per cent																
Total Improvement of Group IIA .... 30.5 per cent																

most valuable to the third quartile of the high intelligence group, while in the low intelligence group the first quartile appeared to profit the most.

This study has demonstrated the possibilities of reducing pupil errors by the use of improved techniques in teaching. Furthermore, a plan is presented with which the pupil errors can be analyzed and improved teaching techniques substituted, which will serve as a basis for improved teaching. This study suggests the necessity of determining a psychological basis for these pupil errors and using that data in building the improved teaching techniques.

Reference Cited

[1] Fox, Truman D. *Pupil Errors in General Science as a Basis for Modified Teaching.* Unpublished Master's thesis, Department of Education, University of Chicago, 1933. 132 p.

FILMS IN SCIENCE INSTRUCTION

Cline M. Koon

Senior Specialist in Radio and Visual Education in the U. S. Office of Education and Chairman of the American Delegation to the International Congress of Educational and Instructional Cinematography

Science teachers who have found the study of motion pictures to be an interesting subject will find it even more interesting to contemplate the numerous and diverse ways that films might be used to aid them in their daily instruction. Slow-motion and speeded-up films, time lapse and microscopic photography make it possible to reproduce scientific processes and examples in practically every area of science from the eruption of a volcano to a delicate surgical operation. Even ordinary laboratory experiments can be exhibited on a screen so that every member of a large class can see the details more clearly than when the experiment is performed on a laboratory table.

Properly produced science films can be used in many ways to enrich the curriculum and vitalize instruction. Arnspiger[1] found that talking pictures made significant and lasting contributions to learning in natural science. Rulon[2] reported that in the Harvard experiment sound films improved the efficiency of learning in ninth-grade general science approximately 20%. Other studies likewise indicate the value of films in the teaching of science.

The United States Department of Agriculture and the Bureau of Mines have been producing scientific films for years. The Eastman teaching films and those of several national scientific societies and well known companies have been used extensively in the teaching of science. Some theatrical films have shown excellent treatment of scientific material. Perhaps the highest degree of skill in the production of instructional films has been shown in the production of the University of Chicago science films by Erpi.

With the perfection of the 16 mm. sound-on-film projector and increased national and international planning in the production and distribution of science films, the use of films in science instruction, without doubt, will increase many fold. Science teachers should take note of the rapid strides being made towards the perfection of the 16 mm. sound-on-film projector, as well as the forward steps in national and international planning.

The International Congress of Educational and Instructional Cinematography, which was held in Rome April 19–25, 1934, adopted a series of resolutions recognizing the importance of science films and the desirability of international planning. The resolutions follow:

"The Congress having made acquaintance with the publication planned by the Institute for Educational Cinematography of an Encyclopedia of medical and surgical films, for which purpose special committees have been created in many countries to determine the scientific material suitable to be filmed for the use of students, physicians, post graduate schools and hospitals, makes the following resolutions:

1) that medico-surgical committees be established in other States, and that the Cinema-Surgical Encyclopedia may as far as possible be an international expression of the progress attained by surgery;

2) that the Institute should continue the work already begun of preparing international catalogues of scientific films and that the official committees for scientific films should cooperate to this end with the I. I. E. C., so that the work of cataloguing may be complete and of uniform system, such as to meet the requirements of science and technique;

3) that similar initiatives be undertaken as far as possible with regard to those branches of science in which such initiatives are likely to prove most useful, by creating special scientific committees which should have as their only purpose the study of the application of the cinema to scientific research and to the development and improvement of scientific teaching;

4) that the Hygiene Section of the League of Nations should collaborate through a suitable accord with the I. I. E. C. both with regard to the Encyclopedia and any other projects for assuring propaganda, by means of the film; of the principles of hygiene;

5) that film producers should take due account of the output of scientific films, keeping in close contact with the scientific world through its experts together with the cinema technicians; each in his own field should make the largest number possible of scientific pictures for use not only in the institutions interested but also for the mass of people who frequent the cinema;

6) that cinema exhibitors throughout the world include in their programmes the projection of scientific films together with educational pictures and that the governments of the various states, by means of suitable legislation and fiscal relief, encourage the projection of such films as part of every show.

"The Congress desires that the International Institute of Educational Cinematography should initiate as soon as possible the constitution of a Film Library destined to collect the best scientific films and that the different sources of production (institutes, companies and private organizations) should send a positive copy of their films to this library in order to constitute gradually a Film Archive which will assure the preservation of those films and be a centre of consultation for persons and institutions interested in viewing them."

Science teachers are in an excellent position to recognize the inertia which usually retards the application of scientific improvements in education. With their customary exactitude they want to be sure the practical problems have been solved before they attempt to make general use of films in instruction. Progress to date is sufficient to warrant experimentation with science films in instruction. It appears probable that by the time science teachers have mastered the technique of teaching with talking pictures, the other problems involved will be solved so that films can be used in science instruction whenever their use will materially improve the teaching-learning situation.

REFERENCES CITED

[1] Arnspiger, V. C. *Measuring the Effectiveness of Sound Pictures as Teaching Aids.* New York: Bureau of Publications, Teachers College, Columbia University, 1933. 156 p.

[2] Rulon, P. J. *Sound Motion Picture in Science Teaching.* Cambridge, Massachusetts: Harvard University Press, 1933.

IS THE DEBATE IN COMMON TERMS?

Carleton E. Preston
University of North Carolina

In following the literature in which attempt is made to evaluate instructional methods one is constantly faced with difficulty in interpreting the much used term "lecture-demonstration." Apparently it is employed at present loosely to refer to a variety of procedures which, if placed in graded series, show as end members two that are based on entirely different, if not diametrically opposed, principles. This article is in part a plea that our professional nomenclature may be so revised as to draw a closer distinction at this point.

The derivation of the term "demonstration" indicates the idea of showing. A pure type of demonstration, then, is one in which the instructor does all the showing and explaining to a class that is in a state of passive recipience. Strictly speaking, the term "lecture-demonstration" should be applied to class meetings that differ from ordinary lectures only in that the audience is shown something, usually specimens or phenomena, in addition to listening to the spoken word. So-called "popular" illustrated lectures are good examples of this type. No questions interrupt the speaker, and he asks his audience none other than those used for rhetorical effect.

An entirely different activity regularly takes place in identically the same setting except for a difference in size of the group, namely, what for lack of a better term may be called "class experiment." But here the teacher refrains from showing or explaining; instead, he exerts every effort to get his pupils to show and explain to him. This he does through a running fire of questions, now asking for observations, now for interpretations and inferences, now for suggestions that will aid in planning alternative or advance procedures, in devising checks and safeguards, in establishing right experimental conditions. Although he may act as hands for the class, he stimulates active rather than passive mental response. He welcomes intelligent questions, and wherever possible uses them as footballs, kicking them back into the crowd, to be caught and answered by the student who has the power to deal with them. By skilful direction he gets all to participate in discussion, and at the end he requires each member of the class to prepare in writing a record that involves appreciation and understanding of the salient points covered. Thus, instead of taking upon himself the burden of demonstrating in the class experiment, the teacher transfers it to the members of his class, individually and collectively.

Examination of the write-ups of the various experiments on the comparative values of lecture-demonstration and individual laboratory work tends to show that thus far a rather wide variation between these extremes has existed in the techniques employed—so wide, in fact, that it is perhaps questionable whether a lack of definite agreement in this respect may not be the cause of much of the disagreement in results. It seems improbable that many experimenters have used the absolutely pure lecture-demonstration type as here defined; to do so would at least be to go contrary to usual secondary-school practices. On the other hand, the degree to which the ideal use of the class experiment method is achieved, even when the intent is to employ that method, depends largely on the individual teacher's training and personality. Surely the view-points with respect to stimulating pupil reactions are fundamentally different at the two extremes.

Let us go a step further. If we examine the following series, (a) lecture, (b) lec-

ture-demonstration, (c) class experiment, (d) group experiment, (e) individual experiment, we at once see that somewhere within it lies the line between what is, in its essence, laboratory work and what is not. Where we draw that line depends on our interpretation of "laboratory work."

Even if the discussion already mentioned has thus far failed to give a reliable evaluation of the relative methods, it has at least done good in that it has served to set teachers thinking anew about the objectives fundamental to their work, and caused them to challenge a method firmly entrenched through tradition to show cause why it should continue to maintain its dominance. The investigations thus initiated have led to several discoveries which, while not at all startling, are quite significant once they are brought into the limelight. Among them are the following: that the original practice of making use of the laboratory only when a problem arose whose experimental or observational solution was needed before work could proceed has given way to the practice of going to the laboratory at certain fixed times and remaining there for definite periods of time, no matter whether or not the general progress of the work has reached a stage necessitating laboratory methods; that thus the laboratory and classroom have become increasingly separated; and that formal tasks have been devised to keep students busy, and rather large amounts of so-called laboratory work have been done in cookbook fashion in order to satisfy an artificial and arbitrary time or quantity requirement imposed by higher authorities; in short, that much of the original living spirit of laboratory work has given way to a dead, and deadening, formalism.

Just now both the curtailment of appropriations and the mounting costs of school maintenance due to increased enrollment make it imperative that we examine our methods to see whether we cannot in some way retain all the essential values and yet modify practices in the interests of real economy. In many places today individual laboratory work is practically out of the question owing to equipment and apparatus costs. To what extent can we substitute other types of work without loss of what is fundamental? And here again we come back to our series and to the need for an interpretation.

To define laboratory work, that is, to state its essence in a way acceptable to all, is not easy, for probably not all will agree on any combination of essentials even though each person may be ready to concur on certain points. It is not my intention here to argue in favor of any particular formula, but rather to show that whatever position a teacher takes will determine the point where he draws the line between those methods which contain its spirit and which do not.

If, for example, I take as the first fundamental the idea that laboratory work requires the presence of real objects and the study of real processes, then lecture-demonstration will be included. At the same time even this single postulate rules out much present so-called laboratory work in geography, where maps, models and pictures take the place of the actual topography. Extended only a little further this grades into library work, good in itself and the only comparable line of effort open in some fields, yet hardly acceptable to scientists as a substitute for more intimate contact with actual things, when these are available.

If to this I add the requirement that laboratory work include practice in making observations, in drawing inferences, in recording experiments logically, in use of line representation, thus insisting that the preponderance of the thinking, planning and explaining be done by the pupils, then lecture-demonstration as defined in this paper does not contain its essence, but class experimentation does. If I go still further

and insist that laboratory work shall be quantitative rather than qualitative, or that measurement and manipulation shall be done by each individual student, I limit the field still more closely.

Actually it is doubtful whether we have ever had in secondary schools on a wide scale much laboratory work that was strictly individual throughout the course. Except perhaps in chemistry it has been customary, both for convenience in manipulation and for economy, to have pupils work at least in pairs, in which case the brighter student as a rule does most of the brain work. Nor has this been entirely without benefit, for discussion often helps. The class experiment is of course merely an experiment carried on by a larger group, generally with larger and better apparatus and under leadership that stimulates the discussion and keeps it within profitable channels. The question at present, therefore, may perhaps be stated, "How large can a group for experimentation or observation be made without too great loss?" Doubtless this may vary with the object studied.

To sum up: There is much need of agreement on the meaning of the terms "lecture-demonstration" and "laboratory work" if the experimentation concerning these two methods is to be evaluated on a constant basis. The term "class experiment" is suggested for that type of activity where the burden of observation and explanation is shifted to the pupil. It is the writer's conviction that a large measure of the success of what has up to now been designated as lecture-demonstration may lie in the degree of skill with which the teacher contrives to make the exercise not a demonstration but a class experiment in which all members participate, and that when that degree is great, much of the real spirit of laboratory work is retained.

THE VALUE OF NATURE LEADERSHIP IN CAMP AS TRAINING FOR THE TEACHING OF ELEMENTARY SCIENCE*

William Gould Vinal
School of Education, Western Reserve University

A BRIEF SURVEY OF THE SITUATION

Early American education was of the camper sort. The conquest of the frontier prepared for the impact on nerve energy, the over-social stimulation, and the shortage of fresh air that was to be the result of herding in large cities. The next period was a return to the soil, the forests, and the lakes. The summer camp was one phase of this back-to-the-country movement. The first organized camps were started by men with a biological background. Educational progress has had most of its roots in private endeavor. That was true of the kindergarten, the academy, the college, and of camping.

Similar to the evolution of camping, of governments, of automobiles, of science, is the evolution of the teaching of science. Along with an increase of knowledge the skills, attitudes, and appreciations of science are becoming more fully conceived. The ages of book nature, of specimen gathering, and of rote-naming have passed. New courses of study have comprehensive teaching units. Perhaps the next step is the finding of the relative educational values of the experiences that appear in the elementary-science curriculum. In order to guide children in these more intensive units of

* Paper presented at the meeting of the National Council of Supervisors of Elementary Science on February 24, 1934, in Cleveland, Ohio.

work we must have science teachers with a respectable scholarship, with enriched backgrounds, and with liberal appreciations.

The student-teacher educated in a teachers college should be able to adjust himself to camp needs. It is clear from letters and from published statements of camp directors that such is not the case. Nature study is one of the least popular of camp activities. The consensus of opinion is that this indictment by the children is due to formal leadership. To continue in camp such units as a plastocine zoo, a make-believe fruit store, the recognition of fifty trees, the physiology of a geranium, or the interpretation of Eskimo life on a sand table is an insult to the camper's intelligence. Camping is living and not a world of make-believe living. In camp it is not a goldfish in a jar, a plant in a pot, or a leaf mounted on a card. One sees the chipmunk in the forest. The chipmunk that lives on the fruits of the trees and in turn plants seeds which grow more trees is quite different from the chipmunk that is presented in a picture, or is stuffed, or is in a cage. Camp nature is not in compartments. Life at camp is seen in intimate relationship and interdependence.

Camp experiences will always be different from the more conventional courses in teachers colleges. In camp one lives with the children. In school one can be a successful science teacher without that deep satisfaction of outdoor comradeship. In camp, education is going on from sunrise until long after sundown. The leader offers a nature activity and the boys and girls attend because they want to, while attending one at school is compulsory. Camp is free from traditions. The clothing is different. The air is free from dust, smoke, and pollution. Contagious diseases are at a minimum. Ultra-violet rays are not shut out by opaque window glass. The noises are those of the wild. The forest floor takes the place of the paved streets. It is a place of such activities as body building, swimming, exploring, fire building, outdoor cooking, tracking, stalking, fishing, mountain climbing, and seeing stars in a clear sky. There is a tendency in progressive camps for all counselors to be nature-minded. To be the nature leader in a camp is a challenge.

Presumably the objectives of elementary science whether in school or in camp are the same. A school of education student trained in the technique of presenting those skills, habits, attitudes, facts and appreciations which will enrich life and which will develop the ability to adjust to social order when sent to camp has an opportunity to put his training to actual use. All teachers are expected to be cheerful, playful, and non-interfering but to be cheerful, playful, and non-interfering in camp is a little different. Those traits that have to do with success in schoolroom teaching—sympathy, judgment, self-control, enthusiasm, stimulating power, earnestness — must be strengthened for leadership on the trail. Camps are notable for lessons in unselfishness, fair play and good sportsmanship. A camp director has the right to expect a student-teacher to know something about the teaching of elementary science for appreciation. It is well known that when many of these leaders are given this opportunity in camp that they begin naming natural objects. The campers gradually acquire a distaste for natural history. I have seen the ideals which a student-teacher apparently possessed in school completely routed when the same individual arrived at camp. This is the dualism of theory and practice.

Perhaps the first principle to be acquired by the student-teacher venturing into camp is that although the frontier has gone the spirit of adventure remains. He must recognize this thirst for adventure. In just the same way that the first fire, the first tool, the first creative art, the first

domestic animal, the first canoe, and the first cooking were adventure for primitive man these same activities are adventure to the child in his new world, the camp. Some directors have found it expedient not to let the campers know that so and so is the nature man but introduce him as the camp craft man. All children are interested in pioneering and pioneering, fortunately, is first-class nature study. The leader who starts out with some skill and sympathy dealing with the inherited natures of children gets an emotional response far beyond those from the superimposed creations of the indoor studio.

Another factor that is prepotent in the camp picture is that of physical health. The nature leader must be enough of a camp nurse to know that periods of activity and of relaxation must alternate. He must know poisonous plants and something about first aid in the forest. He must be enough of a camp psychiatrist to know how to deal with the high strung, the grandstand type, the untidy, the over-rich, the parentally non-weaned, the overweight and all the other individuals. Physical buoyancy and nerve control must be the better because of his leadership.

The camp curriculum differs from the school curriculum. Camp leaders have the opportunity of giving the children such enriching experiences as helping or seeing cows milked, riding a horse, feeding wild animals, taming a woodchuck, becoming acquainted with farmers, fishermen, and mountaineers, matching wits with elements, performing chores, and helping in the hay field. The all important problem of conservation is best understood when one practices fire protection, insect control, wild flower and fur-animal protection, the conservation of fish, the feeding of wild birds, and conservative forestry. When a leader gets a clear picture of the camp as an elementary science laboratory he sees it so teeming with opportunities that he has no time for repeating the school program.

With this brief survey of the camp as a desirable place where the prospective teacher of elementary science is to become equipped let us see what prominent educators think of camps.

CAMPING AS EVALUATED BY EDUCATORS IS A PROGRAM OF EDUCATION

Since the time when Charles W. Eliot, in a talk to the National Association of the Directors of Girls' camps, launched the idea that "the organized summer camp is the most important step that America has given the world," there have been kindred statements made by such men as William H. Kilpatrick (1) and David Snedden (2), both of Columbia University; by such nationally-known statesmen as Ray Lyman Wilbur (3), and Governor Gifford Pinchot (4), and in recent years by Clyde R. Miller, Director of the Bureau of Educational Service, Teachers College, Columbia University, and by Professor Goodwin Watson of the same institution. Point 18 of *The Children's Charter of the White House Conference,* which proposes "to supplement the home and the school in the training of youth, and to return to them those interests of which modern life tends to cheat children," gives a final sanction to the idea. Were it necessary, a whole legion of educators might not only be found who are in favor of a camp proper, but a goodly number could be listed who have carried out the idea.

CAMPING IS ALREADY A FUNCTION OF THE PUBLIC SCHOOL PROGRAM

Chicago, Illinois, and Dearborn, Michigan, have camps throughout the entire year which are maintained or directed by Boards of Education of the City public schools. Jersey City, New Jersey, La Crosse and Oshkosh, Wisconsin, have summer camps for public-school children who need to build up their physical health. The West Allis, Wisconsin, Board of Education has recently acquired a 40-acre tract to use for "refor-

estration work" and for 4-H club work. Thirty-one cities are maintaining camps for malnourished or sickly children.

A recommendation that appeared in the 1929 annual report of the Superintendent of Schools of Philadelphia is a prophecy of the day when every boy and girl will have an opportunity of camping. "I would recommend again that a special committee be appointed to find ways and means to establish camps for all pupils in the public schools."

It is estimated that in 1930 one out of twelve boys and girls of school age went to an organized camp.

THE OPINION OF EDUCATORS AS TO THE EFFICACY OF PARTICIPATION IN CAMP AS A MEANS OF TRAINING TEACHERS OF ELEMENTARY SCIENCE

New College Community is an innovation in the education of teachers introduced by Teachers College, Columbia University. It is located on an 1800-acre estate near Asheville, North Carolina. It purports "to give prospective teachers first-hand experience in living, working and studying together in a rural community." A children's camp was opened in the summer of 1934 for practice teaching, although this is not the first time that a children's camp has been established for the training of teachers.

CONCLUSION

We have had to abandon many of the beliefs about the training of teachers of elementary science which have come down to us from earlier days. We have tried to adjust our methods to a rapidly changing social order. In this adjustment too many teachers read about nature, write about it, talk about it, anything but live with it. Their nature study is intellectual but not volitional. Every great nature teacher of the past has intuitively been a part of nature. He has been so saturated with nature experiences that the resulting ideas and emotions have become a part of him. For the City-bred student-teacher, and most of them are, it is only by making nature "motor" that the teacher will find fulfillment and reality. We can no longer divorce teacher training in elementary science from all reality. Camp leadership meets this need more completely than any other offering in our modern society.

ON THE APPROVAL FOR ACCREDITMENT OF COLLEGE SCIENCE LABORATORIES*

N. M. Grier
Myerstown, Pennsylvania

What constitutes standard science laboratories in the colleges? What minimum requirements should they fulfill before being approved by an accrediting organization? In seeking to answer these questions, one is confronted at once with the lack of a clearly defined basis from which to formulate criticisms. The purpose of this paper is to show the need for a more satisfactory method of evaluating these facilities in the colleges. Teaching costs per student credit hour in the college sciences are, in many cases, higher than the average cost of all other subjects combined, including the outlay for apparatus and equipment, thus making science instruction very expensive. At many places, economies in this direction have found expression in inadequate facilities and hence may constitute a source of inefficient instruction, bad professional standards, and costly turnover among the science faculty. Eventually the academic

* Paper presented before Section Q, Education, A. A. A. S. at Atlantic City, N. J., December 27th, 1932.

standing of the institution may be injured. However, such a situation is not always an outgrowth of the limited financial resources of a liberal arts college, for in other cases it appears due to deficiencies involving the administration and personnel.

Administrators of limited background, disregarding earlier promises to the science departments, have been known to expand the teaching staff in other directions before they could be certain that the scientific curriculum was on a good basis. At one institution where this occurred, the president maintained that he was the sole judge of what the science departments required in the way of adequate facilities. His actual generalization was that the teaching of the sciences was somewhat like a home plumbing job; one could get along with fewer tools if he must! Such an attitude would, of course, place a severe strain upon the spirit of cooperation in a faculty, while the desirability of a stricter outside check than that usually given may become apparent. Involved also is the obligation which the institution ought to feel toward the colleges competing with it. An administrator may become still more confused when he learns that he has purchased apparatus principally of value to an instructor who has since relinquished his position, and he may sincerely feel at times that equipment and apparatus purchased in the past have been used too infrequently, serving principally as dust catchers.

As regards the scientific staff, teachers of integrity will sometimes penalize themselves by asking for too little equipment, while more politically minded ones, appreciative of the possibilities in the background of the authorities, may feel it advantageous to minimize their requests below an acceptable level with the view of appearing "economical." Many teachers in the sciences in the past have changed locations on account of the conditions described, but only one case comes to mind where the instructor lost his position because he had failed to requisition for the equipment it was felt he should have. In other situations, apparatus may have to be secured in devious ways, academically speaking, accompanied by a surrender of good standards, and involving a fundamental discrimination against the science instructor. After such sacrifices for the proper support, an instructor may find himself regarded by administration and colleagues as having received a special favor. Occasionally a teacher will demand his rightful dues in the matter and thus obtain what he needs along these lines. He may then find that his constructive efforts have so upset the local academic balance that it is most advantageous to withdraw, perhaps to later learn that he was regarded as being "extravagant."

While it is, of course, well known that many of the colleges are not as thoroughly equipped as they might be, it is seldom realized that they are sometimes weaker in this respect than many of the high schools from which they obtain their students. The effect of such conditions upon the morale of the science instructors is frequently deplorable. If the accrediting associations are thought to have it in their power to somewhat ameliorate these difficulties, the truth is that in this phase of their work they are operating under difficulties which the writer hopes to make better understood. Moreover, there is evidence for believing that they are not impervious to the situation which has been described. Hence it is with appreciation of this attitude that some comment on the general type of the requirements for college scientific laboratories may be tendered, especially since there may have become apparent by now the difficulties involved in the commonly stated requirement that a college must have adequate facilities for the courses offered.

The value of scientific apparatus in an

institution in many cases can not be a criterion of the caliber of instruction available from it. At one place the most appreciable value was represented by expensive furniture, with comparatively little apparatus to use with it. Moreover, some of this was of the type used in secondary schools. In another case a college gave a very fair valuation for its physics apparatus. It was later learned, however, that some friend had presented it with an expensive telescope, but that the rest of the equipment was practically junk. Furthermore, a college investing in scientific apparatus at this time, 1934, can most likely get more for its money than it could a few years ago, when the same sum to be expended might have been inadequate.

Rating an institution by the percentage of scientific apparatus regarded as being effective can also be no reliable guide. As may be inferred, much would depend upon the background of the particular instructor, the type of courses he offered and the factors set forth previously, for in last analysis the instructor himself makes this rating.

Annual expenditures for laboratories as regards (1) maintenance, (2) materials, are useful statistics only when summarized in the light of current economic conditions or most properly from a basis which still remains to be worked out. In one case, a professor arranged for an accumulation of his yearly appropriations over a number of years to await a more advantageous purchasing period. However, the athletic program of this college encountered a deficit, and the departmental savings were confiscated to meet this emergency. Eventually, the particular professor bequeathed a situation which was an important cause of the resignation of his successor. Hence, what has been done with the appropriations is of most importance.

Presumably the laboratory fees should pay for materials used by the student such as gas, electricity, etc., as well as for depreciation in the equipment and apparatus. In considering the importance of this item, it is conceivable that high laboratory fees might be considered as balancing a low annual appropriation; indeed, many science men may rely upon them not only to offset depreciation, but to actually build up their equipment. The latter procedure is of course undesirable, but at times even this device to get around the local situation will not work. Recently, at a fairly large college, a substantial surplus was reported in the treasury at the end of the year, but one of unquestioned authority protested that this was mostly due to the fact that the students did not receive back the full benefit of the laboratory fees that had been paid in. Research was apparently not encouraged among the faculty at this college. Finally, following student objections to laboratory fees, some colleges have abolished them, covering the resulting deficit by an increase in the tuition fees for all students, whether they were taking science courses or not. Regardless of the apparent lack of fairness in this procedure, the significance of data concerning laboratory fees to the accrediting organization is not so clear, especially since there seems to be no well formulated basis of comparison. I have known of but two instructors in the sciences, and there are probably relatively few more, who have made the attempt to work out their laboratory fees on an actual cost basis. An additional point which might be made concerning the particular situation is that it is not at all limited to the church related college of the smaller struggling type. Possibly we shall make better progress in this problem of the laboratory fees when data concerning them can be more conveniently studied. Hence, the importance of colleges at large adopting a more uniform system of accounting as a basic step in this direction.

Special care should be taken to insure that the institution has a live, well-dis-

tributed library as well as adequate appropriations for the purchase of new books, or the quality of the science instruction will be sure to suffer. Various lists of books and periodicals which have been published should make this phase of the accreditment process somewhat less difficult. So far as the writer has been able to determine, the statement of the accrediting organizations that two hours of the science teacher's time in the laboratory are the equivalent of one in the lecture room, has been somewhat arbitrarily made. While this is perhaps the view-point of the majority of science teachers, available evidence indicates that a fair time equivalent in this case will at least depend upon the particular course and the time required for its preparation. Moreover, the local situation will doubtless suggest other considerations which should be kept in view in determining a fair equivalent. From the professional point of view, the accreditment process could be conceived as one which would decidedly favor good teaching, research, personal growth and recreation on the part of the instructor. Unfortunately, the necessary correlations for this end are often absent in the colleges, while the involved problems might well be made the subject of study by professional organizations.

There remains for discussion what may seem to be another defect in the technique of approving for accreditment the scientific laboratories of colleges. Only infrequently does the inspector who visits the scientific departments have an appreciable background in the corresponding fields. Definite provision for such qualifications have already been made by certain State Departments of Education who may call upon professors in the sciences at the State institutions to pass upon the adequacy of all facilities for science instruction. Such a procedure seems not only praiseworthy and logically in accord with the better standards of supervisory practice, but is of great importance under the conditions which have been described. Evidently such inspectors should enjoy a high rating as *teachers* and preferably should have had some experience in smaller institutions. As the antithesis of what has been advocated, the scientific laboratories of a college were inspected and approved by a Ph.D. in teacher training, who had never taught in a liberal arts college, and whose administrative experience in another field had been confined to the secondary level. It seems that his line of reasoning was that the laboratories at this college appeared to be as well equipped as those at another institution which had previously been approved. Possibly, the points which have been made are of especial interest at a time when science teachers of superior training and experience are more freely available to the smaller colleges, and where they are thought to be badly needed.

A well-known textbook on the teaching of secondary science comments upon the difficulties of the biology teacher in convincing the school authorities of his need for adequate equipment and facilities. Indeed, if he wishes to carry on his work in a way which seems consistent with good standards, he may have to seek another connection. Some of the State Departments of Education have recognized this situation in the sciences and have published lists of the apparatus and description of the general facilities required to give the prescribed courses in secondary sciences. No corresponding protection exists for the majority of liberal arts teachers at places where the problems discussed are most apt likely to arise, although a committee of scientific men in Missouri have taken commendable steps toward clearing up their situation by formulating useful data of this kind for the liberal arts and junior colleges of that State. For the junior colleges, the data seem to be unusually complete, including a minimum list of all materials required for

each course which is offered in the sciences.

However, the idea of the minimum list has been criticised, for in any one subject, say general physics, there are at least as many combinations of subject-matter and laboratory practice as there are professors, which to a certain extent is highly commendable. Nevertheless, there has been this demonstration that a reasonably effective minimum list and related data can be compiled, while adequate yearly appropriations could be made to take care of the professor's view-point concerning his courses. Hence, it is believed that the information usually required by accrediting associations concerning scientific laboratories would have a greater significance if used in connection with data of the type available for the Missouri institutions. Additionally, in order that certain implications of the accrediting requirements become more effective, as well as the recommendations of standardizing associations, information which is requested under the head of appropriations made for the sciences, should manifestly inquire concerning the support given their research activities.

Regional groups of professional organizations, such as state academies of science, may possibly be led to take an interest in the formulation of data useful to accrediting associations in appraising the science departments of colleges, inasmuch as some of these bodies have already acted with regard to the conditions surrounding science teaching in colleges in the past. Further interest might eventually have the beneficial result of reducing the extremely large variety of courses offered in the sciences by liberal arts colleges, squeeze the water out of some of them, and facilitate in various ways, equitable administrative procedures. Writers of scientific texts could help by including more universally in their texts, lists of all materials and equipment necessary to give the type of course which they sponsor.

An alternative solution for the difficulties which have been mentioned would consist in the development of experts of scientific background who would correlate the data contributed by specialists in the various fields of use in solving these problems. What has been proposed does not of course represent a final soluton, if only for the consideration of keeping ahead of the antecedent high schools, let alone the testing of the fulfillment of the accrediting requirements, the process of the accreditment of scientific laboratories might best be repeated at intervals, which might well correlate with the planned program of the institution. It is true that institutions with adequate resources are less apt to feel the effect of the conditions described, but in so far as the larger institutions may rely upon the smaller ones for graduate assistants, they might profitably take an interest in the situation, following the precedent of the Missouri faculties.

It is not felt that the present movement in college science instruction toward offering cultural, non-laboratory courses which largely employ the lecture-demonstration method of teaching seriously invalidates what has been written. Indeed, the demand for pre-professional and vocational courses which requires more extensive facilities will doubtless continue in the liberal arts colleges.

FOURTH-GRADE UNIT ON STUDY OF ANIMALS OF THE ENVIRONMENT

Merle Wilson

Third- and Fourth-Grade Critic, State Normal College, Chadron, Nebraska

The fourth-grade unit on study of animals of the environment originated in 1932–1933 while I was critic teacher of the fourth grade in the Maryland State Normal School.

The approach to the study originated in the grade's study of the wild flowers of the environment in the fall. There was class discussion to determine the next topic of study in science. They decided to study the animals. The animals that they knew inhabited their mountain environment were listed on the board. The question to be settled then was what animal should be studied first. One child said, "I think we should study the squirrel first as we see him most often and he is the one whose habits are easiest to watch."

Before taking up any of them we planned our method of study for each animal. We listed on the blackboard the topics which we wished to consider about each animal, namely, order, appearance, home, food, characteristics, habits, size of family, relatives, friends, enemies, protection, and use.

The study of the squirrel was opened by an excursion to the woods where we were fortunate enough to see three squirrels scampering about on the grass and in the trees. We observed broken nutshells they had left about on the ground. During our next science period we filled in on the board our topics as complete as possible from the previous day's observation. During the following days various topics were taken up one at a time, and through class discussion based upon observation, picture study, reading to group by teacher and pupil, observation of specimens brought in, and information obtained from people of the community who hunt and trap, the entire outline was placed on the board. A collection of materials concerning each animal was kept in folders.

One period of fifty minutes a day for a week was spent in the study of each animal.

The art instructor spent some hours in helping the children make charcoal drawings of all animals which was a part of the work they particularly enjoyed.

One of the most interesting activities developed in this study was the play presented in the assembly before the training school using old Christmas trees for the forests and the children represented animals visiting in the forest. The early spring number of their little newspaper was composed of original stories by the class. This is a representative story:

The Opossum

I am an opossum. My cousin is the kangaroo, but I do not look much like him. I belong to the order of marsupials, which means pouched animals. I am whitish gray in color and my face is whiter than the rest of me. My legs are dark, my feet are black, and my toes are white. All four of my legs are the same length with five clawed toes for climbing. My dingy white coat is tipped all over with brown so it is not easy to see me in a tree. My ears are black on the lower half and the rest is white. They do not have any hair on them at all. I have a long whitish tail without any hair on it and I can use it as a monkey uses his tail for climbing and swinging. Oh, here come some hunters and I was just going to say that I play an opossum trick on hunters. I am not going to play opossum this time, but will run home. Good-bye.

The two outstanding outcomes of this unit of study were the development in the child of a more kindly feeling towards animals and the development of a keener interest in his environment.

ELEMENTARY SCHOOL SCIENCE REFERENCE AND INSTRUCTIONAL MATERIALS

G. V. Bruce
New Jersey State Teachers College, Newark

The results of investigation show that the social studies usually dominate the elementary-school curriculum and that natural science is only incidental in the school program if not completely ignored. In the schools where this is true the general library, the children's library and the teacher's card index and files of accumulated reference and instructional materials are mostly of the social studies type, classified in conformity with the established units in use. These social studies units are organized and administered around themes of historical and geographical settings. They focus toward such themes as American Indian Life, Roman Life, Greek Life, Egyptian Life, and then, too, modern life themes are drawn from racial or geographical settings such as Jungle Life or Eskimo Life or a study of Holland, Norway, and so forth.

This is not intended in any way to discount the enthusiasm and skill with which these units are motivated and carried out, nor to detract from the fruitful achievement as evidenced by the many tangible results that fill the halls, the classrooms and the morgue. But fundamentally much of this work seems remote from the lives of the children, both in time and space. The units deal with people of the past or people of far away. They deal likewise with things of the past and things far from the immediate touch of the children. And much of the activity, of necessity, must take the form of symbolical representation of the remote, through the medium of paper, paint and wood.

In the course of these units there is no systematic attempt to interpret for the child the nature and meaning of the great throbbing world of animate and inanimate things of his immediate natural environment. The nature and meaning of the sky and the earth; the relationships of living things; and such common phenomena as fire, thunder, clouds, storms, seasons, gravity, magnetism; and all that constitutes the world of energy and action about him receive very incidental notice in the social science core.

There seems, however, to be a growing tendency among teachers and administrators to concede that elementary science is potentially capable of enriching the program of activities, that the curriculum should draw more of its content from the area of the natural environment, inanimate as well as animate. At the same time they frankly confess a lack of resourcefulness in the field that would enable them to exploit its potential values. These signs are hopeful but the way is long and difficult.

It would seem that the most urgent immediate need of teachers in service could be served by fostering acquaintance with the rich body of reading and instructional materials now being produced in this field, both for teacher and the children. With this end in view the author set about to assemble such a body of materials and to prepare an annotated bibliography of the same for the help of teachers in his service area. Seventy-one publishers were consulted in the attempt to bring it up to date. The whole list consists of five main bibliographical headings with sub-headings. This was thought to be the arrangement

that would prove most convenient for the user.

Bibliography No. I. Science Reference Materials for Children.

1. General Science Series and Readers
2. General Nature Series and Readers
3. The World's Work and Materials
4. Things to Make
5. Things to Do
6. Experiments to Perform
7. Astronomy
8. Geology
9. Weather
10. Physical
11. Chemical
12. Land Animals
13. Water Life
14. Birds
15. Insects
16. Flowers and Plants
17. Trees
18. Gardening
19. Health

Bibliography No. II. Science Reference Materials for Teachers.

1. The Nature of Science and Its Human Implications
2. Biography and History of Science and Discovery
3. History of Man, Plants and Animals —Anthropology and Paleontology
4. General Science
5. Astronomy
6. Geology
7. Weather
8. Physical
9. Chemical
10. Biological

Bibliography No. III. Texts and Laboratory Manuals in Science for Junior- and Senior-High School Levels.

1. General Science
2. Physics
3. Chemistry
4. Biology

Bibliography No. IV. Courses of Study in Elementary Science.

1. State and City Courses
2. Courses by Individuals

Bibliography No. V. Science Club Literature for Both Sponsor and Members.

1. Values, Objectives and Organization
2. Ritual and Initiation Ceremonies
3. Programs, Projects and Playlets

Bibliography No. I, Science Reference Materials for Children, contains the best literature available for children of all grades in the various phases of the natural environment. It is recommended that a liberal amount of this be selected from each of the several classifications and acquired for the children's library. A reasonable amount of guidance by the teacher in the use of this material would soon reflect itself in a noticeable broadening of the children's interests and a stimulus to questions with a consequent greater enrichment of the classroom activities. Much of it would prove, too, an inspiration and revitalization of the work of the teacher who had not heretofore given thought to the potential richness of the elementary science and nature work.

Bibliography No. II, Science Reference Materials for Teachers, is a carefully selected body of literature of non-technical narrative type, written for the interest and enjoyment of the general educated lay reader. The circulation files of general libraries will show that some of the volumes from this group have enjoyed a circulation almost par with that of some of the best works of fiction. It testifies to the recent triumph of the literary scientist in his endeavor to present the world of science to the general public with the charm and thrill of fiction and at the same time preserve the dignity and profundity of its implied truth. For the teacher of children to read one of these volumes from time to time it would induce a fertility of background that would add to the fruitfulness of his efforts to introduce the children to the world of science and nature.

Bibliographies Nos. III, IV and V represent the usual bodies of professional literature, the place and meaning of which in the scheme of teaching is self-evident from the titles. To pass it over with this brief word is not to minimize the importance of these divisions but rather to acknowledge the highly-trained professional insight of the teachers of today as being wholly adequate to the full and proper use that is

commensurate with the importance of these professional materials.

While the entire bibliography was designed for local use, Bibliographies I and II are being published in this and succeeding issues of SCIENCE EDUCATION for any value they may have for the general field.

Book One—We Look About Us. $0.68.
Book Two—Out of Doors. $0.76.
Book Three—Our Wide, Wide World. $0.76.
Book Four—The Earth and Living Things. $0.76.
Book Five—Learning About Our World. $0.76.
Book Six—Our Earth and Its Story. $0.76.

BIBLIOGRAPHY NO. I. SCIENCE REFERENCE MATERIALS FOR CHILDREN

1. GENERAL SCIENCE SERIES AND READERS

ALBRIGHT, N., GORDON, E., HOLTZ, G., and HALL, J., *Nature Stories for Children.* Mentzer, Bush & Co., 31 E. 10th Street, New York. 1934.

These books present nature knowledge through simple, short, concrete stories. In the first four books, plants and animals are included as subjects which can easily be observed by almost any group of children. The third grade book shows that all living things make use of the natural world much as man does.

Book One, Grade 1—1st Semester, $0.54.
Book Two, Grade 1—2nd Semester, $0.54.
Autumn, Grade 2—1st Semester, $0.54.
Spring, Grade 2—2nd Semester, $0.54.
Elementary Science, Book Three, Grade 3, $0.60.

BALLOU, FRANK W., (Edited by). *Elementary Science by Grades.* D. Appleton and Company, 35 West 32nd Street, New York. 1933.

A six-book course in elementary science and nature study. The work is graded in a spiral manner, one book for each grade. Each book is complete in itself. They contain many illustrations, some in full color.

Book I—Persing, E. C. and Peeples, E. K. 1930. $0.72.
Book II—Persing, E. C. and Peeples, E. K. 1928. $0.72.
Book III—Persing, E. C. and Peeples, E. K. 1928. $0.80.
Book IV—Persing, E. C. and Wildman, E. E. 1929. $0.92.
Book V—Persing, E. E. and Thiele, C. L. 1930. $0.96.
Book VI—Persing, E. C. and Hallinger, J. A. 1933. $1.00.

CRAIG, GERALD S. and Co-authors. *Pathways in Science.* Ginn & Co., 70 Fifth Avenue, New York. 1932 and 1933.

A complete basal series in elementary science for grades one to six. This series is the outgrowth of the well-known attempt of Craig to build a course of study on tested criteria and valid objectives.

DORLAND and WOTICKY. *My Science Book.* Rand McNally & Co., 536 S. Clark Street, Chicago, Ill. 1928.

This series contains a thoughfully selected and organized body of science material richly illustrated. The books are fully provided with supplementary demonstrations, experiments and projects in connection with each unit. The experiments are illustrated with line drawings and diagrams.

My Science Book, 7th Year, First Half. $1.28.
My Science Book, 7th Year, Second Half. $1.28.
My Science Book, 8th Year, First Half. $1.32.
My Science Book, 8th Year, Second Half. $1.44.

DUPUY, WM. A. *Romance of Science Series.* John C. Winston Co., 1006–1016 Arch Street, Philadelphia, Pa.

These books are designed to acquaint children with their animal friends and foes in a way that is scientifically sound and at the same time appealing especially to the reading interests of children. Grades 5–8.

Our Insect Friends and Foes. $0.60.
Our Bird Friends and Foes. $0.60.
Our Animal Friends and Foes. $0.60.
Our Plant Friends and Foes. $0.60.

EDWARDS, PAUL GREY and SHERMAN, JAMES WOODWARD. *The Nature Activity Readers.* Little, Brown & Co., 34 Beacon St., Boston, Mass. 1931.

A series of books based upon examination and comparison of all state and many city courses of study. They contain charming stories, simple and accurate vocabulary and interesting activities for the child.

Book I. Our Door Land. Grade I. $0.72.
Book II. The Outdoor Playhouse. Grade II. $0.76.
Book III. The Outdoor World. Grade III. $0.88.

GRAY, WM. S., BEAUCHAMP, WILBUR L., CRAMPTON, GERTRUDE. *Science Stories.* Scott, Foresman and Company, 114 East 23rd St., New York. Grades 1–2. 1933.

A regular unit plan science course, providing opportunity for the child, even at this age, to use

scientific information and methods of thinking for better understanding his environment. It contains a simple, fascinating story content and scientifically accurate pictures.

Book I. 1933. $0.60.
Book II. 1934. $0.60.

McKay, Herbert. *First Steps in Science.* Oxford University Press, 114 Fifth Ave., New York.

This set is designed to introduce the young child to the fundamental scientific processes which go on about him. Each chapter is clearly written and is followed by suggestions for experiment and class discussions with appropriate questions. Grades 5–8.

Book I—Rain in the Garden. $0.40.
Book II—Sound and Noise. $0.40.
Book III—Candles and Lamps. $0.40.
Book IV—The Air and the Wind. $0.40.
Book V—Looking Glasses. $0.40.
Book VI—The Sun and Moon. $0.40.

Meister, Morris. *Living in a World of Science.* Charles Scribner's Sons, 597 Fifth Avenue, New York City.

A series of science books for the seventh and eighth grades, profusely illustrated and treated in a popular, entertaining style which results in making the study of the various units as interesting as story books.

Water and Air. 1930. $1.08.
Heat and Health. 1931. $1.08.
Magnetism and Electricity. 1929. $1.00.
Energy and Power. 1930. $1.08.

Multiple Authorship. *The Natural Science Series.* Follet Publishing Company, 1257 South Wabash Ave., Chicago, Ill.

The Natural Science Series present the story of science as it is today and in language that will be comprehensible and appealing to the child. Each $0.68.

	Grades
How the World Began	4–5
The World of Animals	4 5
How the World Grew Up	4–5
How the World Supports Man	4–5
The World of Insects	5–6
The World's Moods	5 6
Man and His Customs	5–6
This Man-made World	5 6
The Garden of the World	6–7
How the World is Changing	6–7
Races of Men	6–7
The World of Invisible Life	7 8
Other Worlds Than This	7–8
Man and His Records	7 8
How the World Lives	7–8
This Physical World	8–9
What Makes Up the World	8–9

Mulitiple Authorship. *The Western Nature Science Series.* The Harr Wagner Publishing Co., 609 Madison Street, San Francisco, California. 19—.

The authors were guided by the principle that nature study and elementary science should be integrated with nature study as the basis and that elementary science should be closely correlated with reading and the social studies.

Grade I—Our Garden. $1.00.
Grade II—Garden Secrets. $1.00.
Grade III—The Indians Garden. $1.00.
Grade IV—The Padres Garden. $1.00.
Grade V—The Pioneers Pathway. $1.00.
Grade VI—Trails To-day. $1.00.
Grades V and VI—Earth and Sky Trails. $1.00.

Nida, William L. and Stella H. *Nida Science Readers.* D. C. Heath and Co., 285 Columbus Ave., Boston, Mass.

Facts of the biological world are put into narrative form in a way that is stirring to young minds. Both material and vocabulary are graded. The books are a natural introduction to science interests.

Book I—Our Pets. Grades 1–2. 1928. $0.80.
Book II—Trailing Our Animal Friends. Grades 2–3. 1928. $0.88.
Book III—Baby Animal Zoo. Grades 3–4. 1926. $0.88.
Book IV—Animal Life. Grades 4–5. 1926. $0.88.
Book V—Makers of Progress. Grades 5–6. 1926. $0.88.
Book VI—Early Men of Science. Grades 6–7. 1926. $0.88.
Book VII—The Ladder of Life. Grades 7–8. 1930. $0.88.

Patch and Howe. *Nature and Science Readers.* Macmillan Company, 60 Fifth Ave., New York. 1934.

A series, for use as basal textbooks in nature study and elementary science. They provide in story form, information about the most, common, and therefore the most accessible plants, animals, birds, and insects that children can find in their own dooryards. In the books for the upper grades the emphasis changes more from nature study to the study of elementary general science. Full-page color illustrations and numerous drawings in black and white illustrate the stories.

Book I—Hunting. Grade I. $0.80.
Book II—Outdoor Visits. Grade II. $0.84.
Book III—Surprises. Grade III. $0.84.
Book IV—Through Four Seasons. Grade IV. $0.88.
Book V—Science at Home. Grade V. $0.92.
Book VI—The Work of Scientists. Grade VI.

Reh, Frank. *Science Related to Life.* American Book Co., 88 Lexington Ave., New York. 19—.

Available in either a four-book or a two-book edition. Science Related to Life is so simply and

clearly written that it can be used independently by pupils. It takes advantage of the pupils' natural interest in his surroundings, the radio, camera, gasoline and electric motors, etc. Curiosity-arousing material, often in story form, introduces the pupil to each chapter or unit.

Book One—Water, Air and Sound. Grade 7. $0.60.
Book Two—Heat and Health. Grade 7. $0.60.
Book Three — Magnetism and Electricity. Grade 8. $0.60.
Book Four—Light, Forces and Machines. Grade 8. $0.60.
Books One and Two — Combined. Grade 7. $0.92.
Books Three and Four—Combined. Grade 8. $0.96.

TEETER, W. R. and HEISING, C. M. *Early Journeys in Science*. J. B. Lippincott Co., 1249–57 South Wabash Ave., Chicago, Ill.

These texts enable the pupils in the first six elementary grades to become familiar with the lives, environment, and habits of the birds, insects, plants, and animals that form an important part of their living surroundings and to gain an understanding of natural phenomena. Pen-and-ink drawings—scientifically correct, clearly detailed, and graphically planned—are effective in illustrating the subject's habits or characteristic environment.

Book I—Grades I and II. $0.68.
Book II—Grades II and IV. $0.72.
Book III—Grades V and VI. $0.80.

COTTLER, JOSEPH and JAFFE, HAYM. *Heroes of Science*. Little, Brown and Company, 34 Beacon St., Boston, Mass. 1931.

Biographies of nineteen heroes of pure science, biology, and medicine. Much of the material has not appeared before in brief form, and all of it is so presented as to explain both the hero's contribution and the place of his work in relation to man's progress. Grade 7. $0.90.

DARROW, FLOYD, L. *St. Nicholas Book of Science*. D. Appleton-Century Co., 35 West 32nd Street, New York.

Reveals wonders of recent scientific achievements in a way to be interesting to adults as well as children. Practically every field is covered. Illustrated. Grades 5–6. $2.50.

DUPUY, WILLIAM. *Uncle Sam's Modern Miracles*. F. A. Stokes, 443–449 Fourth Ave., New York.

Describes the humanitarian work of the Federal Government in conquering contagion, revealing the weather secrets, transforming the deserts, recompensing the Indians, smoothing the country roads, and performing other duties that are vital to the ordinary citizen. Grades 6–9. $1.75.

DUPUY, WILLIAM. *Uncle Sam's Wonder Worker*. Frederick A. Stokes Co., 443–449 Fourth Ave., New York.

Readable account of the odd activities of the government bureaus. Tells how cotton is grown on trees, how fish are made to help in the pearl button industry, how useful new animals are invented, and a number of other interesting facts. Grades 6–9. $1.75.

FALL, DELOS. *Science for Beginners*. World Book Co., Yonkers-on-Hudson, N. Y. 1913.

A textbook designed by the author to habituate the scientific way of doing things. The selection of material and activities is not to exhaust the field but of such character as to challenge thinking and deliberate procedure in meeting many novel problem situations of a simple science nature. Many interesting experiments are suggested. Grades 6–8. $1.68.

GROVER, E. O. *The Outdoor Primer*. Rand McNally & Co., 536 S. Clark St., Chicago, Ill. 1904.

This primer carries the youthful reader out of doors and directs his attention to the beauties of nature. A number of the lessons are concerned with the birds and small animals of field and grove as well as with household pets. The illustrations are half-tones of scenes and incidents suggested by the text. Grades 1–2. $0.40.

REED, W. MAXWELL. *And That's Why*. Harcourt, Brace and Company, 383 Madison Avenue, New York.

An explanation of natural phenomena in a manner that is intended both to satisfy and stimulate the curiosity of young readers. This book explains such things as clouds, frost, fire and atoms, salt water, rocks, rocks and oil, and thunder, music, and waves of the air. Ages 6–10. $1.25.

SMITH, EDITH LILLIAN. *Everyday Science Projects*. Houghton Mifflin Company, 2 Park Street, Boston, Mass.

Everyday Science Projects is designed to serve as an introduction to the study of general science and also as a basic text for courses in nature study. It is suitable as well for use as a supplementary reader. Illustrated. Grades 5–6. $1.96.

TAPPAN, EVA MARCH. *Wonders of Science*. Houghton Mifflin Company, 2 Park Street, Boston, Mass.

Each of the thirty-five chapters in this book, by specialists in their respective fields, tells the story of some everyday wonder, as Radio, Doing Business by the Weather Map, How Soil is Made, What Bacteria Are. Illustrated. Grades 8–9. $0.96.

(*Continued in the April issue.*)

Abstracts

GENERAL EDUCATION

SPAULDING, FRANK E. "The Progressive Debilitation of the Secondary School." *Harvard Teachers Record* 4: 120–136; June, 1934.

It is the author's thesis that, in the evolution of the American secondary school, we have developed an institution which aims to educate all and which actually is failing to educate most of its pupils in the really vital things necessary to worthy living. Chief among these unfulfilled obligations is the discipline of hard mental work for the young people in our secondary schools. If these schools are to attain their real and greatest purpose they must inculcate in the mind of youth those honest virtues of straight and courageous thinking and a willingness to work hard that alone can cope with the complex social problems which are facing us. —V.H.N.

GROSVENOR, GILBERT, and SHOWALTER, WILLIAM J. "Flags of the World." *The National Geographic Magazine* 66: 339–396; September, 1934.

Flags of the United States government, of each of the various states and of most of the nations of the world are included in the 808 flags and emblems portrayed in color. Brief comment is made about each flag. —C.M.P.

HAMPTON, W. O. "Education for the New Social Order." *The High School Journal* 17: 161–174; May, 1934.

The need for a revision of our basic secondary-school philosophy is clearly presented. "The fact is that the secondary schools are destroying the educational and intellectual interests of children. . . . The basic defect causing this condition lies in training of high-school teachers and what they think to be their task in high school. In all too many instances the teacher who masters a subject in college goes out to the secondary school to teach the subject as it has been taught in college and little or no relation is seen between what she teaches and the philosophy of education." As the reviewer read the above lines he could not help but realize how well they applied to many teachers of science, and was therefore not greatly surprised to find the author of the article choosing this field as illustration to his point. Teachers of high-school science will do well to read the two paragraphs which follow the lines quoted above and to consider thoughtfully to what extent this indictment of their work is true.

—O. E. UNDERHILL.

WOODY, CLIFFORD. "An Evaluation of the Seventh Yearbook." *Educational Method* 13: 394–400; May–June, 1934.

The author presents in condensed form the important phases of the address he gave before the meeting of the Department of Supervisors and Directors of Instruction of the National Education Association, held in Cleveland, Ohio, in February, 1934. He discusses and evaluates various phases of the Yearbook, such as the treatment of the concept of the scientific method; the point of view regarding the meaning and measurement of supervision; the idea of supervision as a cooperative activity; and the supervisor as a research worker and one who uses results of research studies that have been made. —F.G.B.

GOODYKOONTZ, BESS. "The Scientific Method and Creative Supervision." *Educational Method* 13: 385–390; May–June, 1934.

This is an address that was given at the meeting of the Department of Supervisors and Directors of Instruction of the National Education Association, held in Cleveland, Ohio, in February, 1934. The author presents a number of supervisory problems in the solution of which the scientific method may be applied profitably in establishing conditions that will enable the teacher to do her best work, such as problems due to insecurity in tenure and salary; problems created by the need for providing "more service to more pupils with less equipment"; those caused by an inadequately trained teaching staff; those concerned with curriculum development; those associated with the determination of a proper teaching load; and problems of adjustment created by new teachers coming into the service each year. —F.G.B.

RANKIN, PAUL T. "Scientific Method in Supervisory Programs." *Educational Method* 13: 391–393; May–June, 1934.

This article is a summary of the address presented by Dr. Paul T. Rankin, chairman of the Seventh Yearbook Committee, at the meeting of the Department of Supervisors and Directors of Instruction of the National Education Association, held in Cleveland, Ohio, in February, 1934. In it, the author presents the point of view that guided the Committee in developing the Yearbook; distinctive and helpful elements emphasized; and the bases for judging the degree to which a supervisory program is conducted scientifically. —F.G.B.

"Visual Education." *Education* 55: 65–123; October, 1934.

The October issue of *Education* is devoted to a number of discussions relating to visual-sensory education. In the first article, Dr. F. Dean McClusky, Editor of *Education* and Director of the Scarsborough School, Scarsborough, New York, discusses "Basic Values in Visual-Sensory Instruction." In another article, Dr. Clive M. Moon, Senior Specialist in Radio and Visual Education in the United States Department of Interior, Office of Education, summarizes the high points in the meeting of the International Congress of Educational Cinematography held in Rome in April, 1934. Mr. Wilbur Emmert, President of the Department of Visual Instruction of the National Education Association, presents in his article, "Visual-Sensory Education," a discussion of types of visual-sensory aids; visual education departments in cities, colleges, universities, and museums; national organizations; visual-education courses for teacher-training; and current developments in visual-education. Other important articles in this number are the following: McClusky, Howard Y., "Mechanical Aids to Education and the New Teacher—A Prophecy." Brodshaug, M., and Brunstetter, M. R., "The Place of Sound Films in Instruction." Heine, Arthur, "Talking Slide-Films for Visual Education Purposes." Meland, Bernard E., "Visual Trends in Religious Education." Short, William H., "An Intelligent Movie Program." Wray, Robert P., "Do Motion Pictures Conflict with Standards of Morality?" McCord, Eugenia L., "The Educational Museum." Monson, F. B., "Visual Aids in Scouting." —F.G.B.

Russell, William F. "Report of the Dean of Teachers College for the Year Ending June 30, 1934." *Teachers College Record* 36: 181–206; December, 1934.

In this Report, Dean Russell reviews the reasons for the abolition of special departments, and of the School of Education and the School of Practical Arts and for the establishment of five divisions to take the place of the units abolished. The following five divisions were made: (1) Foundations of Education; (2) Organization and Administration of Education; (3) Individual Development and Guidance; (4) Instruction; and (5) Theories and Techniques of Measurement and Research.

Another part of the Report deals with the problem of differentiation of types of students, and the provisions made for regular and for part-time students. The Dean says in referring to the need of adapting courses for part-time students, "We must not forget that Teachers College was founded primarily to serve the needs of the public schools of the City of New York."

A third part of the Report deals with the need for the establishing of "a small Advanced School of Education for the development of an educational elite," with purposes somewhat similar to the present New College which is giving training to the undergraduate educationally elite. The Advanced School would have three departments: (1) Educational Research; (2) Professional Education, and (3) Practical Science.

Another part of the Report refers to the differences in requirements and purposes of the degrees of Doctor of Philosophy and Doctor of Education. —C.M.P.

SCIENCE IN EDUCATION—GENERAL

Mather, Kirtley F. "Keeping Up with Science." *Progressive Education* 11: 256–262 (Numbers 4 and 5); April–May, 1934.

In this article, Dr. Mather, Professor of Geology, Harvard University, and Chairman of the Editorial Committee of the Scientific Book Club, discusses a number of new books that give a survey of certain phases of important fields engaging the attention of scientific workers. The following books are considered:

Bavink, Bernard. *Science and God.* New York: Renal and Hitchcock, 1934. 174 p. $1.50.
Bragg, Sir William. *The Universe of Light.* New York: Macmillan Co. 283 p. $3.50.
Bucher, Walter H. *The Deformation of the Earth's Crust.* Princeton, New Jersey: Princeton University Press. 1934. 581 p. $5.00.
Fenton, Carroll Lane. *The World of Fossils.* New York: D. Appleton-Century Co. 1933. 166 p. $2.00.
Gist, Noel P. and Halbert, L. A. *Urban Society.* New York: Thomas Y. Crowell. 1934. 724 p. $3.50.
Glueck, Eleanor and Sheldon. *One Thousand Juvenile Delinquents.* Cambridge, Massachusetts: Harvard University Press. 1934. 371 p. $3.50.
Langdon-Davies, John. *Inside the Atom.* New York: Harper Brothers. 184 p. $2.00.
Morris, Ann A. *Digging in the Southwest.* New York: Doubleday, Doran and Company. 1933. 301 p. $2.50.
Polakov, Walter N. *The Power Age.* New York: Covici Friede, Inc. 1933. 247 p. $2.00.
Sullivan, J. W. N. *The Limitations of Science.* New York: Viking Press. 1933. 320 p. $2.75.
Swan, W. F. G. *The Architecture of the Universe.* New York: The Macmillan Co. 1934. $4.25.

—F.G.B.

Preston, C. E. The Science Column. *The High School Journal* 17: 179–182; May, 1934.

A brief clear summary of trends toward the development of a unified science program, continuous through all the grades and away from specialization, is presented.

—O. E. Underhill.

Maller, J. B., and Lundeen, G. E. "Superstitions and Emotional Maladjustment." *Journal of Educational Research* 27: 592–617; April, 1934.

In this extensive research, the authors made a study of "the relationship between emotional

adjustment as measured by objective tests and the belief in unfounded ideas." Tests were given to 366 seventh-grade pupils to measure the prevalence of superstititous beliefs and emotional maladjustment, together with a test of "irrational word associations, questions concerning wishes, fears and worries and various background tendencies."

From a detailed analysis of results of these tests, the authors drew the following conclusions:

"The score of superstitious beliefs was found to correlate positively with scores of emotional maladjustment to the extent of $.55 \pm .03$ and with scores of irrational word associations to the extent of $.54 \pm .03$.

"Certain items of the various tests show particularly high correlations with the respective totals as well as with the other measures.

"The number of fears and worries bears a positive relationship to both superstitions and emotional maladjustment.

"Other factors related to these variables include frequency of physical ailments, excessive attendance at movies, severity of discipline in the home, and poor living conditions."

In an appendix to this important study, an analysis is given of items of each test used together with a valuable bibliography.

—F.G.B.

MYER, WALTER E. "The Tennessee Valley Looks to the Future." *National Education Association Journal* 23: 233–247; December, 1934.

Of all the activities of the present administration, the TVA is the most constructive and prophetic. This article, probably as unbiased as any you are likely to find, discusses: (1) The valley as it is; (2) The new industrialism—promise or threat? (3) Laying out the plans; (4) Experiments in planning; (5) Forests and soils; (6) Checking soil erosion; (7) The production of power; (8) Power policy; (9) Encouraging electrification; (10) Government and industry; (11) The future of farms and industry; (12) Working with cooperatives; (13) Planning the industrial future; and (14) What to expect. —C.M.P.

SHANNON, J. R. "A Teacher Self-Analysis Sheet in Elementary Geography." *Journal of Geography* 33: 346–354; December, 1934.

The author presents a teacher self-analysis sheet in geography consisting of 172 questions on the folowing topics: (1) Modern conception; (2) Motivation; (3) Organization of subject-matter; (4) Correlation with other subjects; (5) Field trips; (6) Local geography; (7) Journey geography; (8) Visual aids; (9) Globes; (10) Maps; (11) Problem teaching; (12) Laboratory work; (13) Supplementary material; (14) Other devices; (15) Measuring results; and (16) Results.

—C.M.P.

SCIENCE IN ELEMENTARY SCHOOL

DMOCHOWSKI, A. "Science Teaching in Polish Primary Schools." *The School Science Review* 16: 145–151; December, 1934.

The author is director of the Central Science Laboratory of Wilno. The primary schools consisting of seven years, covering the ages seven to fourteen, present the following science offerings: physics, chemistry and mineralogy forming the so-called "inanimate nature" and botany, zoology, anatomy and biology belonging to "animated nature." As a special subject, science is introduced in the Third class. Inanimate science is first offered in the Fifth class, and continues through the Seventh class. Three class periods a week are given to science. Inanimate science is taught from November 1 to March 15 and animated science during the other parts of the school year. Most of the science work is carried out in central laboratories, zoos, and botanical gardens. The use of central laboratories has proven most satisfactory. Lodz, Cracow, Warsaw and Wilno have about 200 central laboratories. —C.M.P.

BLOUGH, GLENN O., and BRINK, IDA K. "A Science Unit on the Beaver." *The Instructor* 44: 52; 73; December, 1934.

This article describes a science unit, with suggested activities, on the beaver. An excellent list of reference books on the beaver is included.

—C.M.P.

CONNELLEY, RUSSELL L. "A Lesson on Franklin." *The Instructor* 44: 43; January, 1935.

This is a unit on the life of Benjamin Franklin with suggested activities for the upper intermediate grades. —C.M.P.

BOYLE, MARY E. "The Camel." *The Grade Teacher* 52: 34–35; 52: 53; 60; December, 1934.

This illustrated unit on the camel involves considerable science and geography material, offering excellent opportunities for their integration. —C.M.P.

SIENNA, SISTER M. "Wool and Clothing." *The Grade Teacher* 52: 16–17; 56–57; December, 1934.

This is an illustrated unit with suggested classroom activities for carrying out a project of making wool into cloth. —C.M.P.

GRAY, HOWARD A. "An Approach to the Measurement of Biological Attitudes and Appreciations." *Journal of Educational Research* 28: 25–29; September, 1934.

The author suggests experimental means of analyzing the effectiveness of present teaching methods in developing attitudes and appreciation of biological materials and indicates problems in research that may arise from such analyses. He gives definite suggestions for testing attitudes relating to plant and animal studies that are included in Nature Study outlines for upper elementary grades. —F.G.B.

BILLINGER, R. D. "'Open-House' Programs." *Journal of Chemical Education* 11: 494–499; September, 1934.

A description of how one university puts on a chemistry "open house" which attracted some ten thousand visitors. Interesting demonstrations in general chemistry, physical chemistry, quantitative analysis, organic chemistry, and various other features are described. It is believed that such a program is not only interesting and instructive to those who come to see it, but also valuable to the instructors and students who participate. —V.H.N.

DUNBAR, RALPH E., and MANON, ALICE. "Subjects Taught by High-School Chemistry Teachers of South Dakota." *Journal of Chemical Education* 11: 528–529; September, 1934.

Chemistry is offered in 71, or 23.3 per cent of the 304 four-year accredited high schools of South Dakota. There are 72 teachers of chemistry in these schools of whom only five teach chemistry only. The subjects most commonly taught along with chemistry are mathematics, general science, biology and physics. Many others from commercial subjects to physical education are also taught by those who teach chemistry. This study, therefore, bears out once more the findings of Hutson, in showing that most prospective teachers of chemistry in high schools should be prepared to teach, for the first few years at least, subjects other than chemistry. —V.H.N.

MANN, W. M. "Stalking Ants, Savage and Civilized." *The National Geographic Magazine* 66: 171–192; August, 1934.

An unusually interesting article on the ant by the Director of the National Zoological Park, Washington, D. C. The article is accompanied by 18 paintings from life by Hashime Murayama. —C.M.P.

Symposium. *The Science Leaflet* 8: 1–40; October 11, 1934.

Each issue of *The Science Leaflet* has student material in each of the fields of biology, physics and chemistry. This number is devoted to the topics: (1) Discoveries in cells; (2) Floating facts; and (3) The halogens. —C.M.P.

Symposium. Special Science Club Number. *The Science Leaflet* 8: 1–40; September 27, 1934.

This special science club number is devoted to some of the activities of student science clubs throughout the country. A proposed constitution as well as a list of the 430 members of The Students Science Clubs of America is included. —C.M.P.

CHAPMAN, LUCIE and WENDELL. "Beaver." *Natural History* 34: 554–566; October, 1934.

An unusually good article on beavers. It has the best pictures of the beaver and its activity that has ever come to the abstractor's attention. —C.M.P.

CHAPMAN, FRANK M. "My Florida Bird Guests." *Natural History* 34: 523–537; October, 1934.

This article is a résumé of observations on bird life made by the author at the edge of his Miami, Florida, garden during the past winter. Illustrations are included. —C.M.P.

MINER, ROY WALDO. "The Kingdom of the Tides." *Natural History* 34: 361–376; July–August, 1934.

Some of the creatures one may find along the shore line of New England are described in this article. Illustrations are included. —C.M.P.

ALLEN, ARTHUR A. "Blackbirds and Orioles." *The National Geographic Magazine* 66: 111–130; July, 1934.

This is the eighth article in a series describing the bird families of the United States and Canada. There are 48 portraits in color from life by Major Allan Brooks. —C.M.P.

TEALE, EDWIN. "Amazing New Uses Found for Glass." *Popular Science Monthly* 125: 18–19; 118; September, 1934.

New kinds of glass having unusual heat resisting properties, elasticity, strength, electrical resistance, heat absorbing properties, non-splintering property when shattered, and acid resistance properties, are described in this most interesting article. —C.M.P.

BURRILL, HELEN A. "A Geography Program for the High School." *Journal of Geography* 33: 231–236; September, 1934.

The author proposes a high-school geography program that should include one year of physiography, a second year of economic geography and one semester of political geography. A detailed outline of the physiography course is included. —C.M.P.

KOOS, LEONARD V. "Consumer Education in the Secondary School." *School Review* 42:737–750; December. 1934.

After reviewing recent studies in consumer education and indicating some of the implications, the author comes to the general conclusion that the education of consumer has suffered so much neglect because our society has been dominated by ideals of production and distribution and motives of profit-making. —C.M.P.

WHITE, JOHN R. "Among the Big Trees of California." *The National Geographic Magazine* 66:219–232; August, 1934.

The superintendent of Sequoia National Park describes the monarchs (both in size and longevity) of the living world in this article on the Sequoias. There are 14 illustrations.

—C.M.P.

BOGERT, MARSTON T. "Your Nose Knows." *The Scientific Monthly* 39:345–353; October, 1934.

No other sense is so marvelously acute as that of smell. The olfactory nerve is able to detect one 460 millionth of a milligram of the rotten egg odor of ethyl mercapton, this amount being about 250 times less than the minimum amount of sodium that can be detected by the spectroscope! The use of perfumes is quite extensive in commercial products. The article lists innumerable commercial articles whose sales have been greatly increased by the use of perfumes. Odors that seem to be preferred in order of choice include: (1) rose; (2) pine; (3) lilac; (4) violet; (5) lily-of-the-valley; (6) coffee; (7) balsam; (8) cedar, (9) strawberry; (10) wintergreen and apple. —C.M.P.

BROOKS, MAJOR ALLAN. "Far-Flying Wild Fowl and Their Foes." *The National Geographic Magazine* 66:487–528; October, 1934.

The illustrated article on wild geese, ducks, and swans is the ninth of a series of articles on birds. There are 93 portraits in color from life.

—C.M.P.

BENNETT, H. H. "Soil Erosion—A National Menace." *The Scientific Monthly* 39:385–404; November, 1934.

Unrestrained soil erosion is rapidly becoming a national menace, making the United States an empire of worn-out land. Nearly three billion tons of our best soil, worth $400,000,000, annually, is being washed away. Only recently has any planned effort on a nation-wide scale been made to counteract the effects of erosion. This excellent article has many splendid illustrations.

—C.M.P.

WALLING, MORTON C. "Flowers Secret History Told by Your Microscope." *Popular Science Monthly* 125:40–41; 107–109; November, 1934.

This article describes the preparation of different parts of the flower for observation with the microscope. This article is accompanied by illustrations. —C.M.P.

READ, THOMAS T. "Gold and Silver." *Natural History* 34:612–624; November, 1934.

An excellently illustrated and an interestingly written account of the mining and reclamation of the precious metals, gold and silver, is given in this article. —C.M.P.

ANDREWS, ROY CHAPMAN. "Wolf of Mongolia." *Natural History* 34:625–637; November, 1934.

Although the writer makes an apology for telling a "dog story," the reader wishes that he and others would write more such stories. For "Wolf" is the name of a police dog who was the constant companion of Andrews in all of his adventures in Mongolia and the Gobi Desert. "Wolf" exhibited unusual intelligence, albeit he seems to have been properly named. Illustrations are included in the article. —C.M.P.

CARTER, ALBERT. "Collecting Butterflies Thrilling Home Hobby." *Popular Science Monthly* 126:49–52; 112; January, 1935.

The collecting, killing, preservation, and mounting of butterffies is described in this illustrated article. The author has a butterfly farm at Roscoe, California, where he has on it more than 50,000 specimens collected from all parts of the world. —C.M.P.

SCIENCE

Anonymous. "New Tricks of Weather Forecasting." *Popular Mechanics Magazine* 62:706–708; November, 1934.

New instruments and methods used in making weather predictions more accurate are described in this article. —O. E. Underhill.

CORWIN, CHARLES IRWIN. "Stamps Tell the Story of Science." *Popular Science Monthly* 125: 34–37; October, 1934.

To those who have a hobby of collecting stamps, this illustrated article on science as portrayed through stamps, will prove most interesting. —C.M.P.

HANSON, PAUL C. "Power to Come by Radio." *Popular Mechanics Magazine* 62:696–699; November, 1934.

A consideration of the possibilities which might develop with the transmission of power by radio. From the use of powered cables sending out energy which may be picked up by ships and plans to give direction signals, the author jumps to the delivery of power to the household flatiron and electric stove from cables running along the streets.

—O. E. Underhill.

ANONYMOUS. "Cold Air from Steam." *Popular Mechanics Magazine* 62:690–692; November, 1934.

A method of air conditioning is being used in some skyscrapers which employs a steam jet to produce a vacuum under which water is cooled by evaporation sufficiently to circulate in an air cooling system. Water, air and steam are the only substances circulating. The steam plant thus furnishes energy for heating in winter and cooling in summer. —O. E. Underhill.

ANONYMOUS. "The Latest in Television. *Popular Mechanics Magazine* 62:5–6; November, 1934.

An account of a German truck unit which makes sound moving pictures of events which are then scanned and broadcast. "Sound and vision programs are transmitted on neighboring wave lengths but in the receiver the two carriers are picked up by a common aerial circuit, amplified by the common high-frequency stage, and then detected separately. Thus only one tuning control is necessary to get the sound and vision program simultaneously." The receiver employs a large cathode ray tube which receives a 9 x 7½ inch image. —O. E. Underhill.

STEVENS, ROLLIN H., and HOLMES, WENDELL. "Beware the Amanita! An Innocent-looking Mushroom—but a Villain in Disguise." *Hygeia* 12:435–438; May, 1934.

In this article, Wendell Holmes discusses the dangers outlined by Dr. Stevens that the amateur encounters when gathering mushrooms. He describes four of the most common classes of mushrooms. He then gives the chief characteristics that distinguish *Amanita phalloides*, the "death angel," from non-poisonous kinds. In addition, he describes a few of the most common varieties that are found in the United States, a knowledge of which will assist the amateur in the hazardous occupation of gathering mushrooms. —F.G.B.

LILLINGSTON, CLAUDE. "Our Parasites: The Cockroach." *Hygeia* 12:515–518; 520; June, 1934.

This is the first of a series of articles entitled "Our Parasites" which will appear in future numbers of *Hygeia*. In this article, the author discusses the general characteristics of cockroaches; places where they may be found commonly; their food habits; life history; means of protection; habits that make them obnoxious; and methods by which they may be exterminated. —F.G.B.

LILLINGSTON, CLAUDE. "Our Parasites: The Bedbug." *Hygeia* 12:461–643; July, 1934.

This is the second article of the series entitled "Our Parasites" that is being published in *Hygeia*. In it the author considers the wide-spread distribution of the bedbug; its general appearance; characteristics that make it offensive; its method of securing blood; the effect of its bite upon man; its reproduction; the bedbug as a traveler and carrier of disease; and the different methods of exterminating the pest. —F.G.B.

LILLINGSTON, CLAUDE. "Our Parasites: The Tapeworm." *Hygeia* 12:720–732; August, 1934.

In this article, the third of the series entitled "Our Parasites" appearing in *Hygeia*, Dr. Lillingston discusses different species of tapeworms; their prevalence in various sections of the world; their life cycle; the way in which they affect their hosts; experimental work on tapeworms by Professor A. Dantec, of the Faculty of Medicine at Bordeaux; and the treatment for expulsion of these parasites from their hosts.

LILLINGSTON, CLAUDE. "Our Parasites: The Itch Mite." *Hygeia* 12:826–828; September, 1934.

The fourth of the series of articles, "Our Parasites," appearing in *Hygeia*, is devoted to the itch mite which may infest many animals, such as horse, ox, sheep, dog, cat, camel, and lion, as well as man. The author discusses the characteristics by which the itch mite may be identified; its life history; its various habits; and treatment given to free the host from this disagreeable pest. —F.G.B.

LILLINGSTON, CLAUDE. "Our Parasites: The Body Louse." *Hygeia* 12:992–994; November, 1934.

The author gives practical information about the body louse, an almost universal parasite of man. Evidences of its existence date back to early Egyptian days. From this early time to the present day, the louse has played a considerable part in making history through the transmitting of disease from one host to another. The author emphasizes the outstanding characteristics by which the body louse may be identified; its life history; its method of reproduction; food habits; its relation to the spread of certain diseases, and various treatments that are effective in destroying the repulsive vermin. —F.G.B.

NEWELL, LYMAN C. "Chemistry in Old Boston." *Journal of Chemical Education* 11:387–399; July, 1934.

In this article interesting descriptions are given of chemical industries in "Old Boston" referring to the present city of Boston and neighboring towns and to the period, 1630 to about 1815. One of the first things made was salt as it was most

necessary as a preservative. Other industries established with greater or less success were those for the manufacture of leather, glass, potash, iron, beer, rum, and cider, lime, brick, title, and pottery, paper, dyes, tar, gunpowder, soap and candles, gold, silver, copper, bronze, and pewter, and whale oil. The legislature encouraged the establishment of these industries by granting monopolies for stated periods, buying stock, loans, and in other ways. —V.H.N.

LINDBERGH, ANNE MORROW. "Flying Around the North Atlantic." *The National Geographic Magazine* 66: 259–337; September, 1934.

An interesting account of one of the most important geographic and scientific explorations of modern times—the 30,000 mile trip of the Lindberghs around the Atlantic. There are 82 illustrations. —C.M.P.

FISHER, CLYDE. "Where a Comet Struck the Earth." *Natural History* 34: 754–763; December, 1934.

This article, accompanied by several excellent illustrations, describes Meteor Crater near Winslow, Arizona, where more than 300,000,000 tons of rock and soil were dislodged some 50,000 years ago, when a gigantic mass of meteoric iron from outer space collided with the earth. Other meteorite craters so far studied are distributed as follows: Meteor Crater near Winslow, Arizona; one near Odessa, Texas; a group of some thirteen near Henbury in Central Australia; the Wabar Centers in Arabia; a group of craters on the Baltic island of Oesel belonging to Estonia; the Siberian craters; a doubtful one at Ashanti in West Africa; a doubtful group near the coast of South Carolina; a supposed crater in Persian Baluchistan; and the Campo del Cielo craters in Argentina. Meteor Crater in Arizona is the most interesting and impressive of all. —C.M.P.

HUBBLE, EDWIN. "The Realm of the Nebulae." *The Scientific Monthly* 39: 193–202; September, 1934.

The Observable Region of space—the region which can be explored with existing telescopes is about 600 million light years in diameter, throughout which are scattered 100 million nebulae. All nebulae seem to be of the same order of luminosity, each nebulae averaging about 80 million times as bright as the sun and about 800 million times its mass. Nebulae average about a million and a half light years apart. Spectrum analysis shows that the fainter the nebulae the larger the red shift. By means of this red shift it has been computed that some observable nebulae have a velocity of 15,000 miles a second at a distance of about 150 million light years. The density of space is about 10^{-30} grams per cubic centimeter which suggests a universe of about 3000 million light years radius, a volume of two to three million times the volume of the Observable Region, and containing about 500 million nebulae. —C.M.P.

THONE, FRANK. "Scientists Study a Wingless Rooster." *Science News Letter* 26: 234–235; October 13, 1934.

In so far as scientific records go the wingless rooster now being studied by the psychologists and scientists of Princeton University is the first wingless chicken to ever reach adulthood. In all respects the behavior of Wingless (as the rooster is called) has been normal except for the handicaps incident to getting down off of a porch, or on to a roosting place, and so on. —C.M.P.

ADAMS, WALTER S. "The Planets and Their Atmospheres." *The Scientific Monthly* 39: 5–19; July, 1934.

This article by the Director of the Wilson Observatory is one of the best that has been written on the physical conditions of each of the planets. Excellent photographs elucidate the the article. —C.M.P.

ELLSWORTH, LINCOLN. "To Antarctica Again." *Natural History* 34: 332–334; July–August, 1934.

This illustrated article describes the author's proposed flight across the South Polar Continent from Deception Island to Ross Sea. The proposed 1934 flight ended in disaster, but the author is hoping for better luck in his early 1935 flight. —C.M.P.

TALMAN, CHARLES FITZHUGH. "Drought on a Wet Planet." *Natural History* 34: 567–577; October, 1934.

The author of this article, a well known meteorologist, discusses the drought of 1934, the most severe in American history. In the great plains region affected there has been a general decline in rainfall during the last twenty-five years. Droughts are caused by disturbances—of unknown origin—in the normal circulation of the earth's atmosphere. —C.M.P.

FAIRCHILD, DAVID. "Hunting Useful Plants in the Carribean." *The National Geographic Magazine* 66: 705–737; December, 1934.

The author, a noted agricultural explorer of the United States Department of Agriculture, describes his adventures in collecting over 700 varieties and species of plants on a recent trip to the Carribean. There are 39 illustrations. —C.M.P.

New publications

Lippitt, Louisa C. *Hygiene and Home Nursing: A Practical Text for Girls and Women.* Yonkers, N. Y.: World Book Company, 1934. 424 p. $1.24.

For a long time men and women interested in preventive medicine have realized that proper health habits and right attitudes toward personal and community health problems are important factors in a program designed to keep people well. In such a program much of the responsibility for the formation of desirable habits and attitudes falls upon women. Their unique position in the family delegates to them health supervision in the household. To meet this responsibility intelligently, special training is needed in general hygiene and in certain special fields of hygiene. Some knowledge of the common types of illnesses and ways of responding to emergencies that frequently arise in the home are needed also.

Hygiene and Home Nursing is designed to assist in meeting these needs by suggesting a constructive program of health education, providing materials relating to home nursing, and by serving as a textbook appropriate for girls of secondary-school age. As a result of many years of experience in health work and in nursing, the author has selected the health experiences that seem to be of most practical value to girls and women. Excellent line drawings and photographs increase the usefulness of the text.

This book will answer a definite need for those who wish to know how to live better and how to keep well. —F.G.B.

Macpherson, Hector. *Makers of Astronomy.* New York: Oxford University Press, 1933. 240 p. $2.50.

A thorough history of astronomy, stressing the personalities who created the science. The inclusion of many of the lesser known astronomers aids in giving a complete picture of the development of various ideas.

—O. E. Underhill.

Fenton, Carroll L. *The World of Fossils.* New York: D. Appleton-Century and Company, 1933. 183 p. $2.00.

The World of Fossils is a depiction of life of the past geologic time, as reconstructed by fossils, and imbued with a chronological and genealogical presentation of the petrified plants and animals, exploiting the existing superstitions and fears of fossils.

Fenton possesses humor, a keen interest in fossilized nature and a good narrative style, all of which make for an absorbing and interesting book for any reader, scientific or otherwise.

Although the book is informal, it contains in essence the true scientific spirit in its attempt to "resurrect those strange animals that roamed through the world's long vanished past," from a study of fossil remains. —Jack Epstein,
New York University.

Helser, Albert D. *Education of Primitive People.* New York: Fleming, Revell and Company, 1934. 316 p. $3.00.

This book gives an interesting picture of primitive life in Africa and clearly shows a way of bringing education to primitive people that has proved successful. The best approach seems to be to start at the level of the primitive group, to appreciate whatever culture they may have, and to encourage experiences which enrich his social habits and which will meet living needs best. The collection of folk stories, the list of social and life projects, health and agricultural projects are of great value. One chapter tells of the community schools. The entire book is a true first-hand record of the life of a group almost unknown to white people. —W.G.W.

Plath, Otto Emil. *Bumble Bees and Their Ways.* New York: The Macmillan Company, 1934. 201 p. $4.00.

Recent years have seen an increase of high-grade publications devoted to the popularization of science, and ones in which inaccuracy, the great liability of popularization, is at a minimum or *nil.* Thus, if you have ever shared with the reviewer a curiosity concerning the bumble bees, this book will be found to have every earmark of a valuable contribution to the subject. Moreover, the enthusiasm of the author for these favorites of his is such that he is at pains to leave one rightly orientated for his own study of this highly interesting group whenever it may be undertaken.

The success of the author in elucidating the different life histories and social behavior of the more common North American bumble bees—evidently "humble bees" is the English designation—is due perhaps quite as much to his development of simple but adequate methods of handling the bumble bees in artificial nests, as to his unusual enthusiasm, patience and skill as an observer. Attention is called to the promising opportunity for the younger entomologists of our far western states as well as those of Central and South America, because our ignorance of almost all the *Bombidae* peculiar to these regions is nearly complete. Especially of interest is the significant ethological classification outlined in the thirteenth chapter, and the account of the parasitic activities of the species of *Psythyrus*. The latter is not only a notable contribution to general parasitology, but also to the theory of social parasitism in particular, owing to the analogue which it suggests with several workerless and parasitic genera of ants.

Accurate observations on the bumble bees are of unusual evolutionary interest because these insects clearly represent one of the simplest, most primitive, and archaic types of social life among the bees and social hymenoptera in general. Since forms closely related to our modern bees occur in the Baltic amber, we may assume the persistence of these primitive social patterns since lower Oligocene times. Among other new and striking results are the pronounced differences which he has detected in the different species, the singular methods employed by *Bombus fervidus* in dealing with its enemies, and the simple, very plausible explanation of the "trumpeter" bees behavior.

The whole constitutes an attractive handbook of interest to every nature lover, containing as it does an appendix with a detailed account of the more important North American species, a complete bibliography, and many illustrations.

—N. M. Grier

Rendl, Georg. *The Way of a Bee.* New York: Henry Holt and Company, 1933. 168 p. $2.00.

If, as has been said, the number of writings treating of bee life in every aspect of fact and fantasy is more than 20,000, what is the especial merit of this new variation on an old theme? The recommending combination in the author is that of the courage and skill of a poet together with a knowledge of the subject which can only come through spending a lifetime among bees. For the present book is the fruit of those years of grateful watching and curious observation as the son of an Austrian bee keeper, by whom he was taught to so tend and care for the bees, that neither art nor nature were abused. As a result, he writes in cadenced and graceful prose, with dignity, wealth of observation and rare poetic delicacy as he traces the strange cycle of bee life through the changing year. Hence, the literary prominence of the author on the Continent may be well understood.

—N. M. Grier

Mott-Smith, Morton. *The Story of Energy.* New York: D. Appleton-Century Company, 1934. 290 p. $2.00.

This has been one of the most useful books in orienting the reviewer's thinking which has come to his attention in some time. Those things which belong together are brought together in such a way that is very illuminating and gives a unifying idea of the idea of conservation of energy. The unusual treatment of Mayer's work in chapters X and XIII is of interest. The work of the early frontier thinkers is made to fit into the picture in a way which makes very clear the scientific method in the development of ideas and the relation of theory to its application. The reviewer gained an appreciation of the genius of Sadi Carnot far beyond that derived from a study of the Carnot cycle in his undergraduate course in thermodynamics.

The treatment combines in a fascinating manner information about heat and energy transformations, personalities of famous scientists, and philosophy of scientific method. For something to think about for future development in house heating consider the possibility of using the principle of the gas refrigerator for heating. "One could turn on the gas, or build a small fire, and get four or five times as much heat into the house as the fire developed." You can find out how in the chapter on mechanical refrigeration.

—O. E. Underhill

Wesfall, Leon H. *A Study of Verbal Accompaniments To Educational Motion Pictures.* New York: Bureau of Publications. Teachers College, Columbia University, 1934. 65 p. $1.50.

This study attempts to determine the most satisfactory method of giving explanatory material with teaching films. An experiment was made with 25 fifth-grade classes from varying types of schools, in and around New York City. Three films with captions and three sound films were modified so as to produce six different methods of presentation of explanatory matter. Longer captions were added to some of the silent films and existing captions removed from others. Written lectures were prepared of the same material to be read by the teacher; in certain classes teachers prepared their own comment, and in other classes the sound material was replaced by a lecture to be read, by captions, or by teacher comment. A method of rotation was devised so that each class received each type of presentation. An interesting statistical technique has been used to obtain comparable scores for the various groups made necessary in order to overcome inequalities brought about by a shift of the original plan which did not in-

clude the sound films, and by certain omissions due to unavoidable failure to meet certain classes at the prescribed time.

The conclusions indicate that verbal forms of accompaniment are superior for giving understanding as measured by the tests used, and that increasing the length of captions tends to decrease the effectiveness of the films. With the sound films the mechanically prepared lecture is significantly superior to any other form of verbal accompaniment. —O. E. Underhill

WITTELS, FRITZ. *Freud and His Time.* New York: Horace Liveright, Inc., 1931. 450 p. $4.00.

The book is biographical with incidental interpretation of Freud's psychology and philosophy. The reader will struggle to get a fair picture of Freud's contribution to scientific psychology out of the maze of hero worship developed by the author.

It is doubtful if students trained in what Americans believe to be scientific psychology or scientific medicine will accept many of the claims set forth in this volume. Much of it is tinged with metaphysics and much with pure emotionalism.

The book is to be recommended to the student interested in the beginnings of psychoanalysis and not to the general reader. —R.K.W.

CHAPMAN, FRANK M. *Autobiography of a Bird-Lover.* New York: D. Appleton-Century Company, 1933. 420 p. $3.75.

Here is a book that is almost impossible to review. The difficulty is that there are so many different kinds of unusually valuable content that reviewing space can only accommodate a few types. The reader who sees the book will then quite understand the riches from which the reviewer has taken his samples.

The story of Frank Chapman's boyhood and early association with birds will appeal to young people regardless of their interest in birds. It is fascinating because of its direct simplicity in telling about his parents, his tramps, and his hunting alone or with farmer-boy companions. After his schooldays, the boy took employment in a New York bank, and during his six years there, was advanced to positions of importance and trust. He seems to have *made* his living in the bank, but to have *done* his living in the woods and fields of New Jersey. He got his *schooling* in schools and at the bank, but got his *education* with bird lovers and bird books. His final renunciation of business came when he had to decide whether to accept larger business responsibilities and a larger salary, or to start being an ornithologist with no assured income. He choose the poorer, but happier, vocation.

As a boy, Chapman killed birds as did other boy huntsmen of his times, and seems to have been late in developing his sense of protection of native birds. Though he makes no large point of his early bird destruction, he compensated for that in many ways. One way in which he helped is within the early memory of the reviewer. The hideous custom of using whole birds or parts of large birds upon women's hats was almost universal in the decade from 1880 to 1890, and was not uncommon until the early part of the new century. In many cases, the birds were mounted upon the hats as if the bird were in full flight, and the best mounting was the one which made the bird look most lifelike. Even two or three birds might be used on one hat, and the size of birds sometimes carried, suggested that the lady's head was used chiefly as a hat carrier. Bird hunting for millinery uses was carried on almost everywhere. Millions of birds were thus destroyed. Chapman took two afternoon walks on Fourteenth Street in New York City. This was a leading shopping street at that time. With pencil and notebook he made records of the kinds of birds and numbers of each kind observed on that street in these two periods. He found 40 kinds of birds and a total of 173 specimens. They ranged in size from the warblers to the prairie hen. He published the complete list. This, and many other such publications helped arouse public interest, and helped women to sense the absurdity and cruelty of the practice. Regulations slowly followed prohibiting the use of birds for hat decoration. In some localities, an attack was made on the practice by attempting to spread the idea that only women of bad character would use hats with bodies of birds upon them. Such an unfair advantage soon lost its meaning, since practically all discontinued the practice, due possibly to dictates of fashion even more than the desire to conserve the bird population.

At twenty-four years of age, with the salary of fifty dollars per month, Chapman began his connection with the American Museum of Natural History. For almost half a century he has been a leading factor in developing the ornithological work of this great museum. His expeditions into almost all parts of the globe, always resulting in valuable specimens and still more valuable organization of new knowledge, have long since made his work the most advanced of all in ornithology. Many of these journeys are recounted in this book. His published books beginning in 1895 number at least seventeen, and there are also many magazine articles of highest value. These major activities can be mentioned only in this review. Those who read the autobiography will probably agree with the reviewer that the facts of such a great scientist's life are more engaging than any purely imaginative novel can possibly be. —O.W.C.

Kinsey, Alfred C. *Workbook in Biology.* Chicago: J. B. Lippincott Company, 1934. 306. p.

This workbook has been written to accompany the author's *New Introduction to Biology.* It is, to a large extent, a revision of the author's *Field and Laboratory Manual in Biology.* Blank spaces for the pupils to write in are provided with each exercise. Half-tones, drawings, and maps form integral parts of many of the exercises. These new features make this workbook more useful and more attractive than the original *Field and Laboratory Manual in Biology.* High-school teachers of biology should find this work interesting because it contains much new material not found in other biology workbooks and laboratory manuals. —E.D.H.

Hunter, George W., and Knapp, Roy A. *Mastery Tests in General Science.* Set X. 154 p. 0.40; Set Y. 163 p. $0.40. New York: American Book Company, 1934.

These two booklets each contain twenty-one unit tests in the same order and with the same titles as the units in Hunter and Whitman's *Problems in General Science.* They are designed primarily to accompany this general science textbook but since the content of ninth-grade general science courses is pretty well standardized teachers using texts by other authors will no doubt be able to use many of the tests.

Objective type tests are used throughout the books. True-false, multiple-choice, completion, matching, and picture tests are most frequently employed. —E.D.H.

Boyer, Philip A., and Gordon, Hans. *General Science Unit Tests* (Form A). New York: Lyons and Carnahan, 1934. $0.18.

Objective test items are used throughout. Multiple-choice and picture tests are the types most frequently used. The illustrations are not as well done as are the illustrations in most general science textbooks but they no doubt will be found adequate for testing purposes. Teachers and administrators, interested in a low cost set of tests, will wish to examine this booklet.

—E.D.H.

Taine, John (Eric Temple Bell). *Before the Dawn.* Baltimore: The William and Wilkins Company, 1934. 247 p. $2.00.

The author of this book is Professor of Mathematics in the California Institute of Technology. He has long been known as an unusually forceful writer o ntopics of general interest, usually writing under the pseudonym given above.

With remarkable imagination, the author of this story pretends that a device has been invented by means of which he can make visible the scenes of ancient days. His "electronic analyser" turns a "needle of light" into the minute crevices of the oldest diamonds, whence it then spreads a halo or glow, within the range of which the things seen are those that existed when the diamond was being formed. In similar ways the oldest fossils were supposedly used to reproduce the appearance of the environment and life of their formative days. When the "analyser" was turned upon the fossil bone of a dinosaur of many millions of years ago, not only did the ancient dinosaur become visible, but his fellows and the other life and physical conditions of his day could also be thus observed. Then, by holding the "analyser" steadily for a brief time, and using only its dim blue light for one's observations, one might speed up the past ages, and gain a panoramic picture of the occurrences of millions of years. Thus, the panorama of high points in the evolution of the earth and living things mould be made to pass in review.

This fantastic story is based upon much scientific truth. The arguments devised between the three observers are designed to raise many of the questions which have already been raised throughout the history of science. The hero of the story, Belshazzar, a delightfully huge saurian, a mountain of rarely-satiated appetite, was so nearly free from brain that only the grossest sort of purposeful responses were manifest. The unsociable fellows of Belshazzar are made sometimes to migrate, sometimes to die, as needed to illustrate the geologic, climatic and biologic development of the earth. Belshazzar, himself, is used to feature "the dawn of intelligence," but eventually he succumbs to nature's forces.

The book, fantastic almost beyond imagination, nevertheless graphically and humorously depicts the progress of the ages. —O.W.C.

Downing, E. R., and McAtee, Veva M. *Problem-Solving in Biology.* New York: Lyons and Carnahan, 1934. 215 p. $0.80.

When one first sees the cover page and the pictures at the beginnings of units of this workbook he finds it difficult to believe that the work outlined is planned for high-school students. The educational level suggested by exceedingly imaginative and grotesque drawings seems to be that of nature study in the early elementary grades rather than the level of high-school science. Since there are twelve full pages given to these unnatural nature drawings, they give a distinctive appearance to the whole book.

When one examines the outlines for work he discovers that the bizarre drawings referred to above, are intended to enliven a serious and well-organized presentation of biology. Following the plan of most recent textbooks in biology, the biological facts, processes and principles are organized about definite problems. Excellent guides to effective study are included. The section on "Have You Ever Thought about Thinking?", is ingenious in its way of making pupils ask themselves whether they really do think. That section closes

with "Ten Commandments for Good Thinking," as follows:

(1) Thou shalt know thy problem and keep it ever before thee; (2) Thou shalt gather data, organize, and analyze from any typical and significant facts; (3) Thou shalt pass judgment only after exhausting all available data and the use of the best and latest materials; (4) Thou shalt not consider thyself capable of judgment without varied experience, good vocabulary, ability to see problems and weigh values; (5) Thou shalt not be misled by the bizarre, striking, and otherwise misleading appearances of thy neighbor; (6) Thou shalt not bear false witness because of lack of accurate data, poor authority, prejudice, and lack of judgment; (7) Thou shalt draw tentative conclusions but suspend judgments; (8) Thou shalt remember that thou art human and subject to error because of past heritage; (9) Thou shalt have thy moments of reflection wherein there is exterior and interior solitude; (10) Thou shalt not lose thy sense of humor or childish curiosity.

—O.W.C.

HEYL, PAUL R. *The Philosophy of a Scientific Man.* New York: The Vanguard Press, 1933. 182 p. $1.50.

It is now sixty years since Tyndall gave his famous Belfast address before the British Association for the Advancement of Science. Tyndall was known for such researches as those in radiant heat, the physical causes of glaciers and of putrefaction. But when he gave his address as President of the British Association, he astonished his audience by dealing with the broader, deeper, more difficult, but more significant questions of development of the scientific way of doing things. At that time it was becoming popular to present reports of exact studies in science, but discussions of philosophic significance of scientific achievements were restricted chiefly to small groups of scientists. Indeed, even scientists had not clearly defined their own ideas about the significance of their specific discoveries or their methods of work. Tyndall's address, surprising because of its boldness as well as its content, would not cause surprise on either account today. The author of this book, himself one time a Tyndall fellow, had the advantages of the Tyndall environment, and has worked during the more recent period in which adult scientists are really expected to have some kind of a philosophy.

This book deals with the place of reason in nature, the dual aspect of nature, the mystery of evil, the cosmic soul, and finally with the author's contribution which he presents as preferable to the so-called cosmic soul.

The author argues that reason is limited to conscious life, and that conscious life is manifested only in some kind of material organism. Since reason is thus limited to material organisms, many have concluded that reason and material organism are thus coextensive; that is, there could be no existence of so-called human virtues extending beyond material existence. What about such "eternal verities" as truth, love, mercy and justice? The author says that justice has no place apart from human needs. Indeed, justice is a development from human consciousness. So with other human virtues. They are essential, however, as aspects in the development of life, consciousness and reason. The acceptance of these verities as commendable aspects of our present stage of development is so common that bonding companies, for a stated financial consideration, will guarantee against theft and embezzlement. The number of times they are wrong is low enough that the bonding companies make a profit. That means that evolution of the verities has reached a stage of general acceptance. If massive size, not truth, mercy, justice, kindness were the goals, the dinosaurs would have excelled human beings. If in some future days, the verities are not the goals, they will quickly disappear.

The author reaches forward in his speculation to a possible time when the verities will not be matters of highest concern, but will be perhaps recognized as the means through which humans have passed toward other goals. This thought is not easy to grasp. That is, in contemplating the *Cosmos,* we must transcend all things human. He says. "We must learn to leave behind us the 'eternal verities' with other ephemeral necessities. We must learn to envisage without faltering the concept that the universe at large transcends good and evil, justice and mercy, love and hate, all things that are essential to the existence of human society, but have no place where consciousness finds itself."

—O.W.C.

INGE, WILLIAM RALPH. *God and the Astronomers.* New York: Longmans, Green and Company, 1933. 308 p. $4.00.

Those who for long have read the writings of Dean Inge of England have learned to take him seriously. No matter how strongly one may disagree, the forcefulness of thought and comment are arresting. For example, "The world, if it is to have an end in time, must have had a beginning in time." If science accepts the idea that the world will sometime "run down" and stop, the author argues that such an acceptance postulates a beginning. Also, if science accepts the non "run down" idea, the idea of everlasting cumulation, must science not thereby accept a beginning at some definite ancient time. Thus, in either case science must, he argues, accept the idea of a definite beginning of earth and life. Of course science does accept that idea. The question of how the beginning was made is the great question. On this the Dean presents chiefly argumentative discussion. This leaves us about where we were before, except that we have read the argument from a most remarkable expositor.

The eminent clerical scholar deals in turn with the problem of time, God in history, God in the world, and the eternal world. He cites and discusses, and so far as his own satisfaction is concerned, he disposes of the eminent scientist-publicists who have stoutly endeavored to interpret science in terms of its social and religious meanings. No abler discussion, from the clerical point of view, has been presented. Those who want help in rethinking these problems will find this book highly stimulating. But the weight of style and thought make of it a book for readers who are intellectually hungry, not those who seek entertainment. —O.W.C.

DIETZ, DAVID. *The Story of Science.* New York: Sears Publishing Company, Inc., 1932. 387 p. $3.50.

This is a valuable addition to the rapidly growing body of literature which aims to give an up-to-date survey and interpretation of science for the layman. It is interestingly written and a wise selection of material has been made. It presents a good picture of how scientific investigation has increased our knowledge of the world about us.

The book is divided into four parts: Part I, The Story of the Universe"; Part II, "The Story of the Earth"; Part III, "The Story of the Atom"; Part IV, "The Story of Life." The last section of only ninety pages hits only the high spots, closing with a chapter on the unity of the universe.

It seems unfortunate that the author uses the term "positive electron" for what is more commonly called the proton. It seems undesirable in view of the definition of electron to refer to any particle as a "positive" electron. This is still more confusing in reference to the proton as the term has also been used by some writers to refer to the newly discovered positive particle with a mass equal to that of the electron sometimes called the positron. It would seem more desirable to invent new terms than to use such a self-contradictory term as "positive electron."

—O. E. Underhill

WOOD, GEORGE C., and CARPENTER, HARRY A. *Our Environment.* Boston: Allyn and Bacon, 1934. Book II. 522 p. $1.50; Book III. 816 p. $1.80.

These new editions of an already well-known general science text, although retaining the same main units are complete revisions—rewritten, rearranged, and re-illustrated. The second and third volumes are somewhat expanded. The many teaching aids such as lists of key words, summaries, outlines, thought questions and activities are retained and made even more effective.

Book II opens with a unit on "The Heavens." This is made to lead to an understanding of the problems of location and navigation. This is followed by units on weather, water, community sanitation, farm and garden, and conservation of food and health. Book III opens with a unit on matter, energy and work, leading from this into a unit which gives understanding of how man uses the various factors of the environment to his advantage. Unit III deals with science in industry, transportation and communication. Units IV and V tie up the origin of energy in solar radiation with its utilization by living things. Units VI and VII deal with the human body and preservation of health. The text closes with a short unit on improvement of living things.

—O. E. Underhill

BOHR, NIELS. *Atomic Theory and the Description of Nature.* New York: The Macmillan Company, 1934. 110 p. $2.00.

This book consists of an introductory survey and four lectures by the author on the atomic theory in relation to the quantum postulate and theoretical physics in general. The work is undoubtedly authoritative and would be understandable to specialists in physics but it is this reviewer's humble opinion that it would be far too much for the average teacher of high-school physics or high-school chemistry, among whom he at one time counted himself. One notion seems to stand out clearly from a perusal of the book, namely, that our common understanding of causality and space-time relationships no longer can be applied in observations of atomic structure and phenomena, and that far-reaching revisions of these concepts are necessary to a more complete description than we now have of the nature of reality. —V.H.N.

PIEPER, C. J., and BEAUCHAMP, W. L. *Objective Unit Tests on Everyday Problems in Science, Form A.* Chicago: Scott, Foresman & Company, 1934. 68 p. $0.28.

PIEPER, C. J., BEAUCHAMP, W. L. and FRANK, O. D. *Objective Unit Tests on Everyday Problems in Biology, Form A.* Chicago: Scott, Foresman & Company, 1934. 48 p. $0.28.

A test for each unit in each book. The questions are of several sorts though completion exercises predominate. Some of the questions are misleading. "Is vigor, secured by hybridizing, permanent or temporary?" Hybridizing does not always produce vigor. "If two feeble-minded persons marry, will almost all, one-half or one-fourth of the children be feeble-minded?" Some may be normal. —E.R.D.

REDMAN, L. V. and MORY, A. V. *The Romance of Research.* Baltimore: The Williams & Wilkins Company, 1934. 149 p. $1.00.

The authors unlertake too much in a small volume. The successive topics treated are the scientific method, history of scientific discovery and of invention, a survey of scientific accomplishments, organization of research in industry and the scientific approach to social and political problems. The result is for the most part a

catalog-like enumeration of items. If the history of a few typical pieces of research had been given, the reader might feel some of the romance in them. The book serves as a good review outline for one already reasonably familiar with its materials. The forceful and clear cut statements will stimulate him to profitable thought.

—E.R.D.

FISHBEIN, MORRIS, M.D. *Frontiers of Medicine.* Baltimore: The Williams & Wilkins Company, 1933. 207 p. $1.00.

The first 120 pages sketches the history of medicine. It is related largely in biographical terms with enough detail so one sees it as a moving story of individual patience and heroism. The rest of the book outlines the knowledge and techniques that the modern physician has at his disposal. The diseases treated are those in which striking advances have been made in remedial and preventative measures. The book is simply yet well written for the layman.

—E.R.D.

RANKIN, PAUL T., Chairman. *Scientific Methods in Supervisory Programs.* New York: Bureau of Publications, Teachers College, Columbia University, 1934. 177 p. $2.00.

This is the seventh yearbook of the Department of Supervisors and Directors of Instruction of the National Education Association. A very large number of scientific studies have been made in the field of education many of which deal with problems related to supervision. These studies clearly define a problem, collect pertinent facts that are expressed quantitatively, formulate hypotheses of the proper solution, experimentally test such hypotheses and arrive at judgments impartially. Therefore, they are scientific and trustworthy. This report cites nearly two hundred such studies and points out the applications of their results to the problems of supervision grouped under these headings: organization of supervision; planning the supervisory program; appraisal of instruction; promotion of teacher growth; curriculum construction and installation; selection and preparation of instructional materials. Every supervisor must be grateful to this Committee for the report puts at his disposal, in usable form, the results of such a host of significant studies, most of which he could only procure at great labor and would find it even more difficult to read and digest.

—E.R.D.

MCINTOSH, D. C., and ORR, D. M., Editors. *First Problems in Agriculture.* New York: American Book Company, 1934. 468 p. $1.20.

In the preface to the book, Governor William H. Murray says "When I became governor of the state . . . I was enabled to enlist Henry G. Bennett, President of Oklahoma Agricultural and Mechanical College, to direct his faculty to the task of writing a book on the subject for the seventh and eighth grades, promising to let them become the authors and the scientists, while I would be the reader and critic, taking the place of the small boy, keeping in mind the necessity of his understanding and interest in the subject-matter." In spite of the handicap the faculty seems to have produced a very good elementary text. The Governor's picture appears as the frontispiece; one wonders what principle of agriculture it illustrates.

—E.R.D.

CURTIS, FRANCIS D., CALDWELL, OTIS W., and SHERMAN, NINA HENRY. *Teacher's Manual and Key for Biology for Today.* Boston: Ginn and Company, 1934. 158 p.

It answers the questions asked in the text so that the teacher does not have to think, and gives instructions as to the conduct of the experiments and other work outlined in the text. Surely the way of the biology teacher is made easy. At least he should obtain some good training in methods of instruction under the direction of these skillful authors.

—E.R.D.

SUTTON, RICHARD L. *An Arctic Safari.* St. Louis: The C. V. Mosby Company, 1932. 199 p. $2.25.

This is a most interesting story of an Arctic expedition out of Tromso, Norway, in a chartered sealer the "Isbjorn," the purpose of the expedition being to collect Arctic specimens for the University of Kansas. Boys and girls who have enjoyed the adventures of David Putnam and Deric Nusbaum will enjoy Dick and Emmy Lou's adventures with polar bears, walruses, whales, seals, icebergs and snowstorms. The book is illustrated with more than a hundred illustrations.

—C.M.P.

BEEBE, WILLIAM, *Exploring with Beebe.* New York: G. P. Putnam's Sons, 1932. 208 p. $2.50.

This book contains selections taken from *Galapagas, The Arcturus Adventure, Beneath Tropic Seas, Jungle Days,* and *Pheasant Jungles.* They are selected particularly for reading by young pupils, say from the sixth grade up. There is no upper limit, for adults find the articles intensely interesting and, no wonder, because Beebe has selected the most interesting and exciting incidents, which are told in the five volumes named above. There are sixteen full-page half-tones, which add to the attractiveness of the volume.

—W.G.W.

News and announcements

REPORT OF THE ASSOCIATION OF SCIENCE TEACHERS OF THE MIDDLE STATES

The fourteenth annual meeting of the Association was held in the Music Room of the Hotel Chalfonte, Atlantic City, December 1, 1934, with Dr. Winthrop R. Wright in the chair. The meeting began at 10 o'clock according to the published program:

The Science Club as an Aid in the Teaching of Science. Merwin M. Peake, Lafayette Junior High School, Elizabeth, N. J.

High School Science—A Foundation for Science Courses in College. Ralph E. Horton, Seward Park High School, New York City.

An Unproved Asset for College Students. Walter A. Scott, Swarthmore College.

Business Meeting.

Subscription Luncheon, Blue Room, Hotel Chalfonte.

Address—*Physics Teaching as Seen by a Has-Been.* J. O. Perrine, Amer. Tel. and Tel. Co.

Mr. Peake presented, with a wealth of illustrative material, the advantages of club work to the pupils, to the science subjects, to other curricula, to the school in general. He made a careful analysis of objectives, and showed the ramifications of the pupils' interest within the school. In the lively discussion that followed details of organization, tests, and results were emphasized. One of the audience pointed out that very evidently the personality of the speaker was a large factor in the success of this particular club work.

Dr. Horton used his topic as an introduction to a careful analysis of the relationship of secondary and college science courses. He discussed the difficulties in both fields, the practices often necessitated by these difficulties and suggested solutions, such as different kinds of courses based on different objectives, pandemic courses, progressive sequence with minimum and enriched requirements. He pointed out there are no definite college courses for which the secondary school can prepare; that no sequence exists between high school and college courses.

According to Dr. Scott, there are certain shortcomings on the part of college students that he should like to see corrected in the secondary school—lack of a critical attitude in laboratory work; lack of capacity to *read* a textbook; lack of discrimination between essential and non-essential. After citing a number of authors on what college men went, such as some manipulative skill, learning a methodical way of solving problems, acquiring a historical and biographical background of science. Dr. Scott made certain proposals for zoology. Secondary biology should be largely descriptive, with a study of the major groups of animals and plants, especially of local fauna and flora. Pupils should acquire an understanding of the plants and animals in relation to the terrain; study external anatomy, with little or no internal anatomy. Many of the atrocious textbooks are the work of propagandists.

Ample time was allowed by the chairman for discussion, which became lively and heated (with restraint), participated in by many of the members present. It brought out the need of greater understanding between college and secondary schoolmen, of the problems and difficulties of each field, and the necessity of facing one's own problems without "passing the buck" to the other group. In order to have a short business meeting the chairman was compelled to interrupt the discussion.

The first item of business was the report of the nominating committee, by Dr. Robert W. Kunzig, chairman, as follows:

President, Dr. S. R. Powers, Professor of Natural Science, Columbia University.

Vice-President, Clarence E. Feick, Head of Science Department, South Philadelphia Boys' High School.

Secretary-Treasurer, Dena D. Ungemach, Head of Science Department, Overbrook High School, Philadelphia.

Members of Council, Dr. Winthrop R. Wright, Swarthmore College; Wilmarth I. Jacobs, Mercersburg Academy, Mercersburg, Pa.; Margaretta Atkinson, Philadelphia Girls' High School.

With no other nominations from the floor, on motion, duly made and seconded, the secretary was requested to cast a ballot for the election of the slate as presented. Dr. Powers made a few remarks, emphasizing the significant issues

of the meeting, pointing out that considerable further study is necessary since "we do not speak the same language."

Article I, Sec. 1 of the Constitution was amended by unanimous vote, to read: "This organization shall be called The Association of Science Teachers of the Middle States."

The report of the Committee—Dr. Thomas D. Cope and Dr. E. E. Wildman—on the death of our former President, Dr. Joseph Jameson, was made in a resolution read by Dr. Wildman.

The Treasurer's report was accepted as follows:

Receipts

Balance from Dec. 2, 1933	$89.77
Dues	44.00
Interest	2.38
	$136.15

Disbursements

Luncheon of speaker and telephone	$3.25
Printing	2.00
Postage	3.00
Cash	.75
In Tradesmen's Bank, 11/28/34	127.15
	$136.15

The request of Mr. Earl Glenn for instructions as delegate to the second meeting of Science Teachers arranged by the Committee on the Place of Science was referred to the secretary. The consensus was that Mr. Glenn should be uninstructed, the group having every confidence in his judgment.

Dr. Perrine at the luncheon charmed his auditors with his liberal and enthusiastic remarks of a business man's view of his former work.

The afternoon session closed at 3:15 P. M.

DENA D. UNGEMACH,
Secretary-Treasurer.

SIXTEENTH ANNUAL MEETING OF N. C. S. E. S.

FEBRUARY 23, 1935

Hotel Chelsea, Atlantic City, N. J.

Forenoon meeting, 9:30–11:45.

9:30 *The Rooms, Service, Furnishings, and Equipment Used in the Teaching of Elementary Science in the Grades.*
H. A. Cunningham, Kent State College, Kent, Ohio.

10:00 *Elementary Science with the Classroom Teacher.*
Agnes W. Nemir, Supervisor of Elementary Science, Glens Falls, New York.

10:20 *The Development of a Program in Science and Health for the Kepner Elementary School.*
Rose Lammel, Colorado State College, Greeley, Colorado.

10:40 *The Use of Live Animals in Elementary Science Work.*
Morris B. Shoemaker, North Arlington, New Jersey. Formerly at the State Museum, Trenton. (Mr. Shoemaker will bring the live animals with him for demonstration.)

11:10 *Finding and Using the Natural Resources of the Community.*
Marcia A. Everett, Department of Public Instruction, Belvidere, New Jersey.

11:30 *Discussion.*

12:15 *Luncheon Meeting.*
Guest speaker, Professor C. B. Bazzoni, University of Pennsylvania.
Messages to Elementary Science Teachers—from Albert Einstein, Henry Fairfield Osborn, and Harlow Shapley.
(Secure luncheon ticket ($1.50) from Lois M. Shoemaker, State Teachers College, Trenton, New Jersey.)

Afternoon meeting.

2:14 *The Integration of Science and Social Studies in the Elementary Schools.*
Rose Wyler, State Normal School, Plattsburgh, New York.

2:40 *The Integration of Pure Science and Social Science at the High School Level.*
David E. Harrower, Woodmore Academy, Woodmore, New York.

3:05 *Science Activities in the Elementary Schools of Nutley, New Jersey.*
Margie Phillips, Washington School, Nutley, New Jersey.

3:30 *Discussion.*

3:45 *Business Meeting for Members Only.*

Saturday Evening

6:30 P. M.
Joint dinner meeting with the National Association for Research in Science Teaching at Hotel Chelsea.

Monday Afternoon, February 25

2:30 P. M.
Joint meeting with the Department of Supervisors and Directors of Instruction. Auditorium. Committee Room 2.

Problems in the Supervision of Elementary School Science

Presiding.
Edward E. Wildman, Director of Science Education, Philadelphia, Pennsylvania.

The Place of Science in the Elementary School Program.
Mrs. Dessalee Ryan Dudley, Assistant Superintendent, Battle Creek, Mich.

The Organization of the Course in Science for Elementary Schools.
Gerald S. Craig, Teachers College, Columbia University.

The Question of Science Equipment and Materials.
Harry A. Carpenter, Specialist in Science, Rochester, New York.

The Training of Teachers of Science in Elementary Schools.
Charles J. Pieper, New York University, New York.

PROGRAM OF THE EIGHTH ANNUAL MEETING OF THE NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING*

ATLANTIC CITY, NEW JERSEY—
FEBRUARY 24, 25, 26, 1935
Headquarters: Hotel Chelsea

Executive Committee
ARCHER W. HURD, *President*
EDWARD E. WILDMAN, *Vice-President*
S. RALPH POWERS, *Secretary-Treasurer*
C. LOUIS THIELE
RALPH K. WATKINS

Sunday, February 24, 1935
Hotel Chelsea

9:00 A. M.—Meeting of the Board of Experimentation.
10:00 A. M.—Committee Meetings.

Dinner Meeting, 6:30 P. M.—For Members Only
(*Private Dining Room*)
DR. ARCHER W. HURD, *Presiding*

Report of the Committee Cooperating with the A. A. A. S. Committee on the Place of Science in Education. Harry A. Carpenter, Chairman.

Report of the Publications Committee and the Special Yearbook Committee. Charles J. Pieper, Chairman.

Report of the Committee Appointed to Study Eligibility for Membership. Gerald S. Craig, Chairman.

Report of the Committee on Tenure and Rotation of Office. Hanor A. Webb, Chairman.

Report of the Executive Committee. Edward E. Wildman, Chairman.

Report of the Program Committee. Morris Meister, Chairman.

Report of the Board of Experimentation. Archer W. Hurd, Chairman.

General discussion of policies, *etcetera.*

Monday, February 25, 1935—Hotel Chelsea, Room C, 9:00 A. M.
DR. ARCHER W. HURD, *Presiding*

Brief reports from 9:00 to 9:45.
Committee on Elementary School Curriculum. Florence G. Billig, Chairman.
Summary of Results of a General Science Test Given to 6000 Pupils in Philadelphia Schools. E. E. Wildman.
Learning Outcomes in High-School Physical Science. F. A. Riedel.
Experimental Data on the Teaching Unit—"Sound, Hearing, and Music." Archer W. Hurd.

Symposium from 9:45 to 11:45. *General Theme—Teaching Science for the Purpose of Influencing Behavior.*
Introduction by Francis D. Curtis.
Brief papers by Ralph K. Watkins, Victor H. Noll, Otis W. Caldwell (to be read by Dr. Meister), George C. Wood, and Morris Meister.
Discussion from the floor.
Summary of discussion, pointing toward next steps to be taken in further investigation of the problem. S. Ralph Powers.

Business Meeting at 11:45.
Election of Officers.
Unfinished Business.

Tuesday, February 26, 1935—Hotel Chelsea, Room C, 9:15 A. M.
DR. ARCHER W. HURD, *Presiding*

Joint Meeting of the American Educational Research Association and The National Association for Research in Science Teaching.

Theme—*Applications of Educational Research to Actual Practice.*
Survey of Some Experiments in Science Education. R. J. Havighurst, General Education Board, New York City.
An Evaluation Project in Connection with the Eight-Year Experiment of the Progressive Education Association. Ralph W. Tyler, Ohio State University, Columbus, Ohio.

* For information about SCIENCE EDUCATION, the official Journal of this Association, communicate with Mr. Clarence M. Pruitt, Business Manager, 509 West 121st Street, New York City.

Curriculum Analysis as a Basis for Determining Science Rooms, Service, and Furnishings in Teachers Colleges. H. A. Cunningham, Kent State College, Kent, Ohio.

Organization of Secondary School Chemistry According to Utilitarian Principles. R. P. Wray, Pennsylvania State College, State College, Pa.

Some Methods Used to Determine What Children Know About Sex. Earl S. Goudey, Bronxville Public Schools, New York.

Cenco News Chats, now being published regularly by the Central Scientific Company, gives to its readers valuable articles on laboratory apparatus and supplies sold by the company. New pieces of demonstration apparatus are described, apparatus and chemical notes given, and helpful hints for the laboratory are included. The "bargain counter" list of materials at reduced prices makes it possible to obtain useful pieces of apparatus at a small sum. With *Turtox News* published by the General Biological Supply House *Cenco New Chats* provides for all science teachers the type of informational material which should assure more concrete learning activities for students of scence.

On Friday, November 23, 1934, the National Forest Conservation Commission approved the purchase by the United States Forest Service of 4000 acres of primeval forest still standing in western Warren County, Pennsylvania, in the northwest section of the state, and within the limits of the Allegheny National Forest Reservation. It is known as the Tionesta Tract.

The stand is mainly a hemlock-mixed hardwood type, with fine old trees here and there of black cherry and cucumber. The Pennsylvania Forestry Association has been urging the preservation of this tract for the past three years as a forest laboratory where only observation, not experimentation, should be carried on. It is with this understanding that the Commission authorized its purchase. Trails will be made into the forest where they can be laid without cutting, but no camping there is contemplated. The tract is described in a recent issue of *American Forests* by R. D. Forbes, Allegheny Forest Research Director, under the title the "The Thousandth Acre."

The Forest Service wants to see how this forest maintains itself and its wild life century after century totally undisturbed by man. Its fauna and flora are typical of the Middle Atlantic States, and therefore this tract is unique, for those of the nearest primeval regions now preserved—the Adirondacks on the north and the Great Smokies on the south—are different in many features.

Not only professional foresters, but every student of natural history and every lover of the untouched wilderness will be glad to hear of the success of the Association in this endeavor.

Historically, its preservation is most fitting, for this tract is part of the actual forest that gave the name *Pennsylvania* to the province when it was granted to William Penn in 1681. Indeed, the Association began its work for the preservation of this tract as its part of the program of celebration in 1932 of the 250th anniversary of the coming of William Penn to his province. Philadelphia and other cities along the Delaware celebrated that event in various beautiful and appropriate ways, but for lovers of the out-of-doors, and Penn himself was one, the preservation of this large tract of Penn's own woods will be counted perhaps first in such a memorial program.

If you love the out-of-doors yourself and value this perpetual addition to our public domain, won't you show your appreciation of the work of the Pennsylvania Forestry Association by becoming a member of it? Its journal, *Forest Leaves,* is issued quarterly and is full of interesting forest lore. This is an active, going, and growing Association, doing everything in its power to help our forests and to increase the enjoyment of them by our citizens, both younger and older. You can help it by joining it and asking your friends to join also.

Send check for $3.00, membership fee good till December 31, 1935, to Roy A. Wright, Treasurer, 306 Commercial Trust Building, Philadelphia. The Association has other big things to do in 1935 and needs your encouragement.